

CIA FDD TRANS NO 955

SELECTED TRANSLATIONS FROM

Approved For Release 2000/08/09 : CIA-RDP85T00875R000300090011-4
"VOYENNAYA MYSL'", NO 10, 1965

25 MARCH 1966

FDD TRANS NO 955

1 OF 2

RECORD COPY



FOREIGN DOCUMENTS DIVISION

TRANSLATION

Number 975

12-15-75

SELECTED FOREIGN DOCUMENTS FOR THE DIRECTOR

12-15-75

CENTRAL INTELLIGENCE AGENCY

Voyennaya Mysl' (Military Thought) is a monthly organ of the USSR Ministry of Defense, printed by the ministry's Military Publishing House, Moscow. The articles translated herein are from Issue No 10, October 1965 which was signed for the press 22 September 1965.

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SOME URGENT PROBLEMS IN MILITARY ENGINEERING PSYCHOLOGY 1

by B. LOMOV, corresponding member of the Academy of Pedagogical Sciences
RSFSR, Col V. OFITSEROV, and Lt Col V. RUBAKHIN

The provision of our armed forces with new equipment leads to a change in the nature of the relationship between man and machine. Automated systems that not only supply power and perform technological functions, but systems which perform administrative functions as well, are being implemented on an increasing scale. An intermediary link, as it were, forms between the soldier and the weapon -- a complex control system. In a certain sense this separates the person from the weapon, makes the control process a remote control operation, decreases the number of moving components, decreases the physical load, but at the same time increases the mental load, and complicates the structure of movements.

The perception and processing of information, programming of action, adoption of decisions and control are gaining an increasing role in the work of the soldier. At the same time modern military equipment is characterized by high speeds, the complexity of many processes and unexpected situations. A pilot, for instance, in a modern fighter has to operate his aircraft under the influence of considerable G-force factors, and at speeds exceeding the speed of sound. Under such conditions a person does not have the time to fully perceive the rapidly changing situation, and react in time and correctly to the readings on tens of instruments. The preparation of missiles for launching is measured in very short periods of time and must be carried out in strict correspondence with the assigned program. The activities of the air defense and antimissile defense crews are also highly limited in time and take place in a complex and constantly changing situation. All this sharply increases the demands made on the sensory organs of the person, as well as on the intellectual and emotional-will power elements of military activities.

In addition to this it is also necessary to remember that in a future war it will be necessary to function under conditions created by the use of weapons of mass destruction. Powerful nuclear blasts with their blinding flashes and high temperatures, areas of extensive fires and destruction, large areas of radioactive and chemical contamination, instantaneous mass losses of personnel and materiel -- this is far from a complete picture of modern combat. In such combat the nervous system of the soldier will be subjected to superstimuli. If ordinary disturbances (noise, bright lights, low or high temperatures) exert an inhibiting effect on human activity, super-stimuli may completely disorganize a person's entire behavior, disrupt the performance of firmly learned and habitual functions.

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producing an appropriate effect in combat. It is necessary to take human capabilities into account, peculiarities of human sensory organs, human intellectual and motor activity, or, speaking in general, the peculiarities of human psyche. In the past, when the armament, materiel and conditions of their use were not as complicated, an accurate consideration of human capabilities was, perhaps, not always necessary. At the present time, however, it is impossible to get by without such a consideration.

As commonly known at the beginning of World War II some type of military equipment did not produce the result expected of it when it was designed. Because of the numerous mistakes made by the personnel using such equipment there occurred frequent breakdowns and accidents, which decreased its combat efficiency. It is also necessary to point out the fact that the training of specialists took a very long period of time. The training of an American fighter pilot at that time took about one-fourth of the pilot's total time in the service and cost 50,000 dollars. Special analysis indicated that all this, for the most part, occurred because of a failure to take into account such factors as the physiological and psychological peculiarities of the personnel in the designing and creation of military equipment. Subsequently, as a result of engineering-psychological research, it was possible to increase the efficiency with which the military equipment was used, at the same time accelerating the training of the personnel. The resolution of technical questions, with a consideration of the psychophysiological peculiarities of the personnel, promotes an increase in the combat ability of the troops, and, in the end, increases the economy features and the efficiency of the equipment being designed.

As reported in the foreign press the US Air Force annually loses between 300 and 400 pilots and about 500 aircraft.² Statistics have indicated that human error is the main cause of accidents: incorrect identification of instruments, imperfect depth perception or an incorrect determination of the aircraft position, inaccurate operation of controls. Between 1953 and 1965 the cost of accidents involving aircraft cost some 721 million dollars in the US. American psychologists worked out the ANIP (Army Navy Instrumentation Program), which changed the representation of certain flight parameters, particularly during landings, from instrument readings to television images. This system eliminated many of the errors formerly made by pilots. It is interesting to note that the cost of scientific research and design work performed in accordance with the ANIP program came to a total of only 26 million dollars over a ten-year period.

During the postwar years a certain amount of experience was acquired in collaboration between the designers and physiologists, psychologists and doctors during the design of some types of military equipment. This first of all applies to air force and air defense equipment. Not too much, however, has been accomplished thus far. The combat training of military

pilots evidences the fact that not everything is taken into account in the design of aircraft cockpits. Officer-aviators V. Ochakov, A. Paterkin and P. Sablin, for instance, write that at first glance the cockpit of a modern missile-armed aircraft appears to be ultimate perfection. The designers made sure to equip it with all that is necessary to control the operation of the numerous units of this most complex machine. At the same time, however, they note, it is important to remember that, in the last analysis, the machine is controlled by people, and these people have a certain limit to their physiological capacities. There is such a large number of switches, levers and dials that in some situations it is practically impossible for the pilot to find the ones he needs, particularly if time is of critical essence. The letter writers categorically protest against an increase in the number of instruments, which no longer ease, but, on the contrary, complicate the pilot's work.

Similar examples may be also cited with regard to other types of weapons and equipment. They all indicate that under the present-day conditions there is an immeasurable increase in the role of military psychology in general, and in military engineering psychology in particular.

Military engineering psychology is usually understood to be a branch of military psychology studying the role and functions of man in the control of complex military equipment for the purpose of achieving its most efficient utilization. On the one hand military engineering psychology rests on the theory of the art of war, on general psychology and the psychology of labor, while on the other hand it rests on the technical and mathematical sciences: theory of automatic control, theory of information, theory of mass operation, etc.

The role of military engineering psychology increases in the course of the technical rearmament of the forces. It was born in the 1940's as an independent science in connection with the tasks that had to be resolved in the design of military equipment. At the present time the military psychologists are engaged in a detailed study of human functions in the operation of aircraft, radar equipment, missile complexes and other types of complex military equipment. In the US, for instance, psychological research was primarily concentrated in the air force. Now special attention is being devoted to an investigation of the role of humans on board a space ship, in the interests of the military utilization of space.

What problems does military engineering psychology resolve?

The most important program is the determination of the optimal distribution of functions between man and military equipment. This is particularly important with regard to automated systems: which functions should be delegated to the machine, and which ones should be left up to humans? This, to a great extent, predetermines not only the reliability and accuracy of the entire system, but its economical operation.

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The distribution of functions between man and machine is, first of all, a psychological question. Engineering psychology permits the most comprehensive analysis of the possibilities available to man and machines, and helps to determine the functions and efficiency of each of them. The continuous development of technology and the perfection of personnel makes it necessary for engineering psychology to periodically re-evaluate the functions of humans and machines.

The practical resolution of the given problem insistently demands a detailed determination of the psychological structure of the human operator's activities, as the most important link in the control system. Special research carried out by psychologists indicate that the structure of this activity is highly peculiar and complex, since it is associated with the utilization of clearly expressed "game" control systems and with the resolution of operating tasks. The specific features of this activity is, first of all, the remote control method of operating weapons, equipment and processes. The thing is that the actual missiles and targets, as a rule, are inaccessible for direct perception. The operators of a radar station, for example, do not see the actual targets they are tracking, while the operators of the control systems of some missile installations see neither the target, nor the missiles themselves. This peculiarity gives rise to a number of individual operations: decoding of information being perceived, restoration of information either lost or distorted by noise, analysis of the information for sense, and other operations.

It is also necessary to say that the activity of the operator, particularly a military operator, has not yet been fully studied. This to a great degree explains the difficulties encountered in the creation of theoretical-informational models describing the behavior of the operator in various systems. In all cases when determining the place and role of the operator in technical systems profound knowledge and an all around accounting is required of the possibilities of the person's analysers (sensory organs), the maximum speed with which he can act, his accuracy, reliability and resistance to interference when working. It is necessary to know these characteristics for each of the stages involved in the work of the operator both in the perception of information and the resolution of problems, and in the performance of various operations in response.

The limits of sensitivity of human analysers are commonly called thresholds. Stimuli are not perceived beyond the upper and lower thresholds. The resolving power of the eye³ for instance, under favorable conditions of visibility on the average is equal to one angular minute. Objects with smaller angular characteristics are not perceived by the eye. The threshold of discrimination is reversely proportional to the contrast threshold. The latter is equal to 1.5-2.0 percent (in the sphere of medium brightness). Under normal conditions the eye reacts to colors having wave lengths of from 380 to 760 nm. The human audio analyser distinguishes sounds within the limits of 16-20 cycles per second (lower limits) up to 15-20 thousand cycles per second (upper limits).

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The human perception time for elementary information and for its processing comes to an average of 0.25-0.30 of a second. The minimum reaction time to signals coming in rapid succession is around 0.25 of a second, with intervals of from 2.57 to 2.91 seconds between the signals, while the minimum interval between the signals must be no less than 0.5 of a second. If the interval is less the reaction to the next signal is delayed.

It should be mentioned that the limits of human sensitivity are not permanently unchangeable. They depend on the influence of external factors and, in addition to that, as it will be pointed out later, they change in the process of training and with the acquisition of practical experience.

Modern psychology has hundreds of characteristics similar to those cited above. Their correct accounting will substantially increase the accuracy and efficiency with which the equipment is used. The importance of this becomes evident if it is taken into account that the probability of error free work by a system as a whole is equal to the product of the probability of error free work of each element. The least accurate element in the control systems turns out to be man. A decrease in his errors, in a number of cases, may be more effective for the entire system, than a decrease in the errors of the machine links. There is, for instance, no point in making a super accurate instrument, if the scale is calibrated so that the operator can make gross errors in taking the readings from it. That is why an incomplete, and all the more, an inaccurate accounting of the psychic possibilities of man lead to a sharp decrease in the effectiveness of the various systems, and sometimes completely nullifies the technical possibilities of such systems.

The problem concerning the reliability of human work has been studied much less than the problem concerning speed and accuracy of human actions. At the same time, in the opinion of many scientists, this is important not only for technology, but also for modern psychology. This refers to a determination of the length of time during which the operator can perform various operations with an assigned degree of accuracy, a determination of the manner in which his so-called reliability changes in the course of the day, the causes of these changes, etc. The reliability of the operator is associated with his working ability, and with the degree of fatigue. It was not by accident that so much time was devoted to questions concerning fatigability of humans, particularly in the process of receiving and processing information, at the XV International Congress on Applied Psychology. The reliability of the work performed by operators depends also on their capacity for observation, in other words, their mental and sensory vigilance. The thing is that constant observation of homogeneous signals quickly brings about the state of fatigue and drowsiness, which decreases vigilance. Under conditions involving monotonous observations the operator can miss an important signal. The struggle against such phenomena is also a task of military engineering psychology.

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The reliability of the operator also depends on his resistance to interference, i.e., on his ability to work in a concentrated manner under conditions involving distracting stimuli (noise, vibrations, high or low temperature). The problems of the operator's resistance to interference has not yet been adequately studied. The available research material, devoted, in part, to the influence of noise and vibration on humans in aircraft, submarines and tanks, indicate that external interference cause perceptible shifts in an entire series of physiological and psychic functions, at the same time deaccelerating sensory-motor processes. The influence of such interference is intensified particularly in dangerous situations, causing affective psychic states in humans. These states are expressed mostly in tenseness, which seems to bind the operator, and when it changes into fear it disorganizes all of his activities. In view of the fact that the combat work of a soldier-operator will take place in most cases in dangerous situations, the problem of tenseness is not only a specific problem, but one of the most important problems of military psychology in general and of military engineering psychology in particular. Unfortunately this problem has also been investigated only to a limited degree. The initial results that are available indicate that military engineering psychology can contribute something useful in this respect as well.

In order to achieve an optimum distribution of functions between the operator and the military equipment it is necessary to know the mechanisms of the informational activity of humans, their capability of receiving, processing, storing and transmitting information.

It is known that the human brain consists of 12-16 billion neurons and has a colossal capacity for storing information: from $1.5 \cdot 10^6$ to 10^{21} binary units⁴.

Humans, however, utilize less than half of these potential possibilities. The thing is that information flows to the brain several times slower than it is processed in the brain. The "input" of information is carried out through the human analysers and therefore depends on their transmissivity.

The transmissivity of the visual analyser, at first glance, may appear to be most significant. It is, for instance, equal to 58 binary units per second in the identification of digits, and 91 binary units in the identification of letters. This, however, pertains only to the simplest information, to the resolution of elementary identification problems. As the task is made more complicated, the transmissivity of the visual analyser drops sharply. It also depends on the signal time, their content, the degree of fatigue and the training background of the operator.

Such a substantial diversion between the information storage capacity of the brain and the possibilities of feed information to it poses an exceptionally important problem before science: the problem of the optimum information coding. The latter presupposes the resolution of such problems as the selection of the optimum character of the signals, the saturation of each signal with information, the determination of the permissible rate at which the signals may be presented in different forms, and under different working conditions.

Military engineering psychology resolves these questions primarily as they apply to the work of military operators. The resolution of the question concerning the analyser that could be used to the best advantage for the transmission of various signals (visual, audio, etc.). The reading of aircraft instruments, for instance, is primarily a visual function. As a result of this the visual analyser is overloaded, and the pilot tires easily which leads to errors in aircraft control and often results in accidents. Engineering psychology research indicated the realistic possibility of easing the load on the pilot's vision by shifting part of the visual signals to audio signals. The results that were obtained confirmed that a more optimum distribution of signals among the different analysers facilitates control of the aircraft and makes it more accurate and reliable.

Humans are not as fast as machines, they are not as good as the machine in their resistance to interference, in transmissivity and in other parameters. A modern electronic computer, for instance, is capable of performing 10,000 operations per second, while a neuron of the visual analyser is capable of only several dozen operations per second. There occurs the question whether man should be completely excluded from the control system? It turns out that this is impossible to accomplish. Man is not chained by a program, and he possesses great sensory (perceptual) flexibility, i.e., he has the capacity of properly evaluating signals within much greater limits than a machine, he can react to the most unexpected signals, and also select the most economical methods of action in a situation that may develop, etc. Man, therefore, is the most universal and plastic link in the control system.

An important problem of military engineering psychology is the provision of the designers with necessary data for the design of new types of military equipment (particularly units involving the reflection of information being received, and controls). The participation of military psychologists is necessary in all stages of the work -- from the design of the system to its implementation into serial production. They will help from the very start to correctly distribute functions between man and machine, and bring the design into correspondence with human capabilities, thus avoiding numerous unfortunate blunders.

of engineering psychology, devoted to the design of the operators' work places, the determination of the most effective forms and dimensions of instrument dials, and to the study of aircraft controls.

The principles involved in the distribution of fittings on the control panels have now been more or less determined. The main principle is the principle of significance, in accordance with which everything associated with the performance of the main operation must be located in the most convenient spots, in a scientifically important one. It demands the grouping of indicator instruments and controls according to their purpose. The frequency of use principle should also be mentioned, in accordance with which the instruments used most frequently must always be "under hand."

Quite a few special investigations were devoted to the problem of the readability of the indicator instruments, with the aid of which information is transmitted from the machine to man in the present day control systems. Just recently the prevalent opinion was that the larger the instrument the greater the speed and accuracy with which it is read. Research determined that dials with a diameter of around 75 mm are read best if they are located no more than 75 cm from the operator's eyes. The efficiency with which the dials are read is, in general, determined by their angular dimensions. According to the results produced by the experiments the optimal angular dimensions of the scales are within $2.5^{\circ} - 5.0^{\circ}$. As far as the calibration of the dials is concerned, the minimum width of the lines on the dials must be 1.5-2 times greater than the threshold width. In the case of small aircraft instruments, for instance, the lines must be 0.8-1.0 mm wide, while the lines on the larger instruments must be 1.2-1.5 mm.

When using symbol indicators the first place position in identification accuracy is possessed by digits formed by straight lines. In many control systems a considerable effect is produced by the use of combination indicators, for instance, those combining radar images with symbol indication. Color coding, i.e., the utilization of color as a signal, particularly violet, blue, green, yellow and red colors (depending on the demands made on the dials and their purposes), is very effective.

Until recently, in designing controls, economy of working motions of the operator was the main consideration. In accordance with that principle it was considered that of all the possible motions executed by the operator those requiring the least effort should be selected, covering the least distance. Such an approach proved to be somewhat incorrect.

Present day research in the field of engineering psychology indicates that the economy of motions principle is not the main factor in the design of controls. Principal errors made by the operator are caused not by the extra efforts and motions, but by the improper design of control panels, which do not provide optimal conditions for action in accordance with the task. Most of the errors made by the operator are caused by the fact

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that he confuses the controls, forgets to execute necessary actions, and performs the reverse motions. All this, in the last analysis, is associated with the difficulties of distinguishing controls and relating them to the readings on the indicator instruments. Military engineering psychology is making concrete recommendations for the best distribution of controls in the aircraft cockpits.

Interest is presented by data concerning the highest efficiency which is attained in manipulating controls, the spacial and time characteristics of whose movements are coordinated with signals. It has been proven that the efficiency of work done by a person increases when special indicator instruments are used showing the results of his actions, i.e., when there is feedback in the control process. This permits an immediate rectification of any error and increases the safety in the operation of various systems.

Still, despite the positive results that have been attained this field can be considered as having been fully elaborated at the level of present day military practice. The psychomotor sphere of the operator's activities should be studied. The concept that the "button" activity of the operator is elementary from the viewpoint of its dynamic qualities, is far from the truth. An investigation of this question indicates that even the simplest motions have a complex structure. For instance, when pressing a button the fingers perform over 60, and when a toggle switch is tripped, over 80 micro-motions. The motor activity of the operator as a whole must be just as complex in the light of such data! We know very little about that however. At the same time a detailed knowledge of these questions would permit a new approach to the design of controls, and could open up new ways of rationalizing the operator's work.

On the whole the task of military engineering psychology consists not only of adapting the equipment to man as well as possible, but also, on the contrary, of "adapting" man to the equipment as well. This gives rise to as important a problem as the elaboration of scientifically substantiated recommendations concerning the development of sensitivity, memory, rapid thinking and psychomotor qualities in the military personnel.

Practice and special research convincingly indicate that there are great reserves available for increasing the sensory, motor and intellectual possibilities of humans. It is known, for instance, that the resolving power of the eyes of trained aerial photo interpreters, (binocular vision) is equal to several angles of the eyes of untrained persons. The same is true of the auditory and olfactory organs of experienced

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pilots can detect a 12-22% change in the number of engine revolutions, whereas ordinary people can detect a 8%-10% change in engine revolutions.

In order to utilize these psycho-physiological reserves specially organized training of the soldiers is required. Consequently military engineering psychology is capable of making a substantial contribution to the training of Soviet soldiers, particularly of the engineering troops. Let us not, by the way, think that the method of training military operators is just now making its first steps and does not yet have a sufficient theoretical-pedagogical basis. The participation of military engineering psychology in the design of trainers, training display stands, and other training aids.

Military engineering psychology must have its say in the programming of training as well: it must determine the transmissivity of various analysers, the necessary time for presentation of information, the adaptation of so-called "training machines" to man, etc. The errors that have occurred in this sphere are associated with the inadequate elaboration of theoretical fundamentals of programmed training, in part, with the underevaluation of the data in general, pedagogical and engineering psychology. Here military engineering psychology links up with the psychology of labor, pedagogical psychology and military psychology.

An investigation of the possibilities of simulating psychological processes, primarily those of perception and reasoning with the aid of electronic computers, is of considerable significance among the other problems of military engineering psychology. The role of this problem increases with the further implementation of automation into military practice.

The simulation of psychological processes also has considerable practical significance in the creation of automatic identification machines that could interpret aerial photographs, read topographical maps and various graphic combat documents, and could also perceive oral commands.

This is an exceptionally complex problem, for the perceiving mechanisms must simulate not only complex analytical-synthetic processes of semantic perception and identification. The perception devices created in the US, of the "perceptron" type, have thus far been able to identify only simple objects on aerial photographs with precise outlines.

One of the premises for the further automation of the identification process, the creation of more perfect automatic machines, is the study and simulation of various psychic operations, of which the act of perception is formed.

Some of the important problems faced by military engineering psychology are also the study of group activity of military specialists in the controlling process, study of certain linked psychic and functional relationships, an increase in their independence, as well as study of the problem of psychophysiological compatibility. The latter is a boundary problem between social and engineering psychology. It is also necessary to mention the problem concerning the selection of operators for various branches and arms of the armed forces on the basis of psychology testing.

In the past few years there has been certain animation in the sphere of military psychology and pedagogy, and a number of textbooks and collections were published.⁵ Unfortunately almost all of them fail to illuminate questions pertaining to military engineering psychology, inasmuch as there is still a lack of experimental and statistical materials. The urgent nature of the problems that have arisen requires a broader development of special research in military educational establishments and the scientific research institutions.

Notes:

1. Engineering psychology, a comparatively new science, investigates the relationship between man and machine in "man-machine" systems. This article examines the military aspects of engineering psychology in the light of the revolution in military science.
2. Electronic Information Display Systems, Washington-London, 1963
3. The resolving power of the eye is its ability to distinguish two objects at a certain distance.
4. The binary unit of information is the amount of information received as a result of the one time selection out of two equally probable possibilities. This involves two arbitrary opposite signs (+, -; 1.0 and others. Binary units serve to designate any letter or digit with the aid of different combinations of only two signals in the preparation of textual or digital information for processing by computers.

Notes:

5. Inzhenernaya psikhologiya. sbornik statey (Engineering Psychology. A Collection of Articles (Translated from English), "Progress" Publishing House, 1964; Problemy inzhenernoy psikhologii (material' 1-y lenin-gradskoy konferentsii po inzhenernoy psik. yli), (Problems of Engineering Psychology (Material: the First Leningrad Conference on Engineering Psychology), Publishing House of the Academy of Sciences RSFSR, Issue No 1, 1964; Issues 2 and 3, 1965.

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STRATEGY AND TRANSPORT

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It is generally known that military strategy depends, to a decisive degree, on the state of a country's economy, part of which is transport. From its side strategy exerts a most direct influence on the development of the entire transportation system. To be sure, in various historical periods and in different States this interdependence was manifested to an unequal degree and in various forms. However, to the extent of improvement of the armed forces and military art and the raising of production and means of communication to a higher level, the reciprocal influence of strategy and transport steadily increased, which has been particularly demonstrated in recent years with the radical change in the methods and means of armed combat and the noticeable increase in the capabilities of all types of transport.

In contemporary conditions the overwhelming majority of technical, technological, economic and organizational problems concerning the improvement and utilization of the transportation network to one degree or another affect the interests of military strategy. This is completely natural inasmuch as the conditions and operation of the transportation network in peacetime to a great extent determine the capability of its use both for the timely strengthening of the defense capability of a country or military coalition, and for supporting the combat operations of armed forces in case of the outbreak of war. For example, the construction of new and the reconstruction of existing communication networks, the development of junctions and other connecting points of the various types of transport, the modernization of rolling stock, the improvement of methods and equipment for the control of traffic, etc. are of very important significance for strategy. All of these factors to one degree or another influence the organization of the movement of troops and their supply of all the necessities for waging combat operations.

That is why one of the important missions of strategy is the systematic study of the routing, condition and capacity of the communication network which can be used to prepare for and wage war. An evaluation is made both on one's own and on the territory of a probable enemy of the condition of communications and the transportation objectives of strategic importance, the possibilities of their use, and also the means, methods, priorities and time periods of influence upon them in case of need.

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correctly determined required time periods, volume of military transport and required carrying capacity of the routes of communication. Strategy determines the requirement of armed forces and, within its own resources, of transport maintenance and service (rehabilitation, exploitation, and other factors), directs their preparation and implements the general management of the activity of military transport services.

Agencies of strategic leadership should plan measures directed at a shielding (defense, protection) strategically important transportation objectives from enemy attack, and in case of destruction of important equipment and installations on the routes of communication provide for the possibility of moving troops on foot and shifting freight traffic from one type of transport to another.

In the solution of its problems military strategy is guided by the principle of the greatest combined use of all types of transport as, in contemporary conditions, not one of them individually is in a condition to insure the accomplishment of all wartime transportation. The strategic leadership has at its disposal a special military-transport apparatus. Its structure depends on the composition and organization of the armed forces and also on the system of governmental control of transportation, and therefore in various countries it is different. However, these agencies have basically similar purposes and responsibilities. As a rule in both peacetime and wartime each of them:

prepares and presents to the strategic leadership materials (calculations, projects, plans, etc.), which are necessary for solution by the government of national over-all transport problems, in particular the preparation of networks for operation during wartime;

insures, controls and considers on the basis of instructions of the leadership, in coordination with governmental economic, transport and other agencies, the implementation of decisions applicable to these problems and individual questions;

takes necessary measures for the timely fulfillment of the requirements of the armed forces for movements and transportation using all forms of transport;

directs the organization, training and operation of the military transport services.

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The work in the military transport agencies of subordinate management echelons is conducted in accordance with these basic functions of the higher military transport agency.

One of the most important missions of military strategy consists of the determination of the special purpose orientation and methods of development of the transportation network to meet the conditions and character of the conduct of the war.

In socialist countries the complex development and use of types of transport as component parts of a single network and the coordinated implementation of transportation is accomplished in accordance with the national economic plans.

In capitalist countries transport companies also fully understand the economic advantages of mutually coordinated development of railroad networks and highways, oil and gas lines, water routes and airlines. This also explains the urge toward amalgamation of various types of transport into single transport monopolies. Such a tendency is especially strikingly apparent in the US where railroad companies are joining with motor transport and river transport enterprises. There is an expanding sphere of mixed transport of commercial freight using not only containers but also piggy-back service (truck trailers transported on rail flat-cars, ferries, boats), containers on wheels (rolling stock with chassis, trailer and brake devices adaptable for both rail and highway movement), and river- and sea-going craft.

The movement of freight using containers, piggy-back service and container cars is most widely used in the US and West Germany. Thus, in 1963 in the US alone about 800,000 flat-cars were used only for piggy-back service; in West Germany container cars replaced about 400,000 two-axle freight cars. In Canada almost 200,000 flatcars were loaded with containers and truck trailers - 35 percent more than in 1961; and the extent of mixed rail-motor vehicle transport also increased in France and England.

On this basis there is also an ever expanding introduction of combined movement of troops and equipment using various types of transport under the centralized direction of the military transport agencies. Depending on the scale of the movement (intercontinental, within the limits of adjoining theaters, inside a single theater of military operations, etc.) their management is concentrated in the hands of the military transport agency of the corresponding command (supreme, high command in the theater of operations, etc.).

the US Defense Department organized on a trial basis the mixed container transportation of military freight from central warehouses located in the interior of the country to bases of troop units located in West Germany. The movement was accomplished according to a single plan in the sequence rail, sea, again rail, and followed by motor vehicle transport with direct trans-shipping of the containers (freight car-ship -- freight car-motor vehicle). Delivery of the freight shipment took 10 days.

Analysis of historical experience and the research of foreign military specialists reveals that development of means of communication, taking into account the requirements of the national economy and the considerations of strategy, promotes an increase in the economic and military potential of the country and creates the most favorable conditions for transportation support of operations of armed forces in the course of a war.

There exist two different methods for development of the network. If one proceeds primarily from considerations of the development of the economy then it is most rational to establish on the main axis of transport high capacity rail lines, motor vehicle highways and other main lines with large traffic capacities. This makes it possible to concentrate high capacity freight and passenger traffic on a comparatively small number of such main routes, to put them into operation in short periods of time, and to make the most economical and effective use of transportation facilities. However, in wartime such a network will limit the possibility of dispersing hauling, loading and unloading of troops and cargo. In addition to this, it is very vulnerable and the rebuilding of destroyed major objectives (for example, rail centers) requires large expenditures of time, personnel and resources.

Taking this into consideration all developed countries of the world are increasing the density of the networks of routes of communication in order to create the most favorable conditions for transportation support of possible operations of armed forces. In this manner vitality is increased and the capabilities for dispersing transportation and increasing the maneuverability of transport and the like are being expanded.

In the years of the first 5-year plans, preceding the Great Patriotic War, in the interior regions of our country, especially in the eastern part possessing enormous natural resources, in the interest of building the socialist economy there was developed the construction of new and the reconstruction of existing railway lines, waterways and motor vehicle

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established. And during these years there was in essence created an entire network of qualitatively new routes of communication with considerably greater capacity than formerly. It is important to note that the increase in transportation operations proceeded considerably faster than the increase in the extent of routes of communication; that is, the network was used more intensively on a continuing basis (table 1).

Table 1

Increase in 1940 in Relation to 1928

(1928 equals 1)

| Type Transport | Freight Traffic | Passenger Traffic | Distance | Remarks |
|----------------|-----------------|-------------------|----------|---------------------------------|
| Rail | 4.4 | 4.0 | 1.38 | Ministry of Transport railroads |
| River | 2.3 | 1.8 | 1.5 | Routes for general use* |
| Motor Vehicle | 44.0 | 4.9 | 4.5 | Hard surface roads |
| Oil Pipelines | 5.8 | -- | 2.5 | Mainline pipelines |

*Sea transport service is not included in view of its connection with foreign trade communications.

The progress of the transportation system in our country played a definitely positive role both in the initial period of the war and in the future course of military operations.

In wars of the not too distant past, depending on the dimensions of the territory of a country, the enemy's means and methods of influence and the protection from them, strategy made an entirely different demand on the transportation network in the rear of the country and on that in the theaters of military operations. In probable theaters of military operations. In probable theaters of military operations great attention was devoted not only to increasing the density of the transportation network, but also to increasing its vitality to the depth of the range of weapons of destruction which the enemy had at his disposal.

In contemporary conditions the directed purpose and methods of development of the transportation network and its timely preparation for operation at the beginning period of a possible war would have to be changed. Currently military operation can be spread over the entire territory of a country. All branches of the economy of a country, including the transportation system must be prepared for this in advance, and that factor, of course, must be taken into consideration during peacetime development.

The solution of problems raised in the area of transportation for the years 1961-1980 by the CPSU XXIIInd Party Congress plays and will continue to play a role of no small importance in the preparation of the USSR for the

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prevention of possible aggression and for the repulsion and immediate rout of the enemy. Among the important problems to be solved in the interest of the national economy are: the expansion of transportation and road construction; further technical renewal of railroad and other types of transport; significant increase in the speeds on railroads, ocean and river waterways; coordination of the development of all types of transport as component parts of a single transportation system. In accordance with this at the present time the construction of new and the reconstruction of operational routes of communication, primarily on those axes where the growth of transportation requirements is most intense, are being expanded and accelerated. For coping with large volume freight shipments in short periods of time and for the economic use of transportation facilities on these axes there are being developed main lines equipped with powerful equipment possessing high transportation and traffic capabilities. Going into operation are railroad lines with electric and diesel-electric traction, deep-water river routes, developed seaports and canals, motor vehicle roads with improved surfaces, mainline rail- and gaslines, and important airlines of Union-wide significance. In conformity with the development of the mainline system, inner-region transportation construction is also being accomplished.

Characteristic in transportation machinery building is the increase in tractive power and in the freight and carrying capacity of rolling stock. Of course, to meet the demands of economy other types are also produced; for example, boats for small rivers, small capacity cargo vehicles, etc. At the same time the traveling speed of transportation equipment is also increasing (design, road, cruising). In the course of the next few years the development of the indices on individual lines might be brought to the following magnitudes (table 2).

| Transport Units | Freight Lift or Capacity | Speed (km/hr) | Remarks |
|---------------------------------|-----------------------------|------------------|---|
| Freight Train | 8,000-10,000 tons | 100 | Gross weight |
| Express train | 1,000 persons | 140-160 | On some lines up to 200 km/hr |
| Tanker | 80,000 tons | 35 | In the future up to 45 km/hr |
| Cargo Ship | 12,000-15,000 tons | 120-130 | On hydrofoils |
| Truck-trailer large capacity | 70-80 tons | 80-100 | On roads of categories I - II |
| Passenger plane, jet | 200 persons | 1,000 | In the future up to 2,000-3,000 km/hr |

The increase in carrying capacity and speed of transport units is being combined with improved routes, control, signal and communications equipment, and with the ever-increasing introduction of automation, remote controls and other types of the latest technology. Servicing of the rolling stock classifying and loading-unloading operations are being concentrated in large transportation centers equipped with large-scale means for the complex mechanization of labor consuming work.

Of important significance is the accomplishment of a complex of large-scale technical, technological and organizational measures for the purpose of coordinating the development of all types of transport as component parts of a single transportation system. The distribution of transportation between types of transport is being improved. In the design, construction and reconstruction of routes of communications used jointly for complex transportation there is being developed a closer correlation of the traffic and carrying capacities and the operational capacity of components of terminals and transshipment ports etc., and coordination of basic parameters of rolling stock especially applicable to the conditions of the productivity of transshipment (reloading) work. Important also is the increase in the production of containers and piggy back trailers, rolling stock for their transportation and also for the mixed transportation of various types of freight for direct shipment, as well as the coordination of traffic schedules and technological processes at junction points of various routes of communication. Special agencies

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of various types of transport, and the planning and implementation of transportation. The direct cooperation of transport and other agencies participating in the organization and implementation of transportation is also being improved.

Scientific and technical collaboration and reciprocal assistance in production between socialist countries in the building of transport equipment and machinery and the technical use of all types of transport is constantly expanding. International freight and passenger movements, the greater part of which are transported by railroads, are being accomplished according to coordinated plans.

In conformity with the trend of development of transport, military strategy defines general principles and concrete methods for its timely preparation for steady operation in wartime, taking into consideration the probable character of a future war.

It can be anticipated that in a contemporary war transport will suffer large-scale losses: it is possible that there will be complete or partial destruction of many important transportation centers, large bridges, ports, canals, locks, and main civilian airports, as well as power failures on the main electric railroads. From the very first hours of the war it is possible that the transportation system will be cut into a number of mutually isolated regions and sectors with a considerable portion of the latter located in zones of strong radio-active contamination. The transportation capacity of all types of transport will decrease shortly. Together with this along the network of the communication routes there must be carried out mass movements of troops, the transportation of materiel and other movements which must be accomplished in very compressed time periods.

In peacetime the greater portion of transportation is accomplished by railroads. In the Soviet Union, for example, in 1965, of the total freight hauled according to plan the proportion of rail transport was approximately 70 percent, maritime (including foreign trade) - over 1/4 percent, mainline oil-pipelines - almost 6 percent, motor vehicle over 5 percent, river less than 5 percent, and air - 0.1 percent. According to current calculation in 1980 the rail transport portion of the over-all freight turnover will be reduced to 58-55 percent, and the others will have a corresponding increase to 42-45 percent. As for the absolute volume of freight turnover of the railroads during the period 1966-1980, it should increase approximately 2.4-2.5 times. A corresponding change in the proportion of freight turnover of individual types of transport will take place also in many other socialist countries.

In case of an outbreak of war the role of various types of transport in the implementation of transportation will be substantially changed. Railroads and internal waterways with large hydrotechnical facilities might be destroyed in many places and to restore the traffic will be possible only after completion of a large volume of work. Less vulnerable are pipe-

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lines (to air strikes) and motor vehicle roads. Less time, personnel and equipment is required for their restoration.

Proceeding from the foregoing, it would be logical at the beginning period of a war to assign the main transportation role to motor vehicle and pipeline transport. However, in application this is not practical as they cannot unconditionally replace railroad transport in all places. Also, one cannot count on the fact that in theaters of military operation will be possible to make maximum use of motor vehicle and air transport (in addition, to pump fuel through pipelines), or to use railroads for almost all transportation in the interior of the country. In the first place, it is known that the enemy will strive to deliver powerful nuclear attacks on objectives located in the rear areas of the country. In the second place, the density of the railroad system in many of the interior regions is less than that, for example, in the western theater of military operation. Thus, giving the average railroad density of the USSR a value of 100 percent and comparing it with the density of several of the Union Republics, then, for example, in Kazakhstan the relative magnitude would be about 70 percent, whereas in Belorussia it increases approximately 4.5 times, in the Ukraine almost 6 times, and in the Baltic almost 7 times. The density of the railroad network is even higher in other socialist countries of Europe. For example, in Rumania it is approximately 4.6 km per 100 sq. km of territory, in Poland - 8.5, in Hungary - 11.1, in Czechoslovakia - 12.4 and in East Germany - 15 km per 100 sq. km (Socialist and Capitalist Countries in Figures. Gospolitizdat, 1963. Data compiled for 1961-1962 and rounded off to 0.1 km per 100 sq. km.)

Without the help of motor vehicle, pipeline, and, where possible, also air transport, rear area railroad lines will not be able to operate. Consequently, for the movement of troops, hauling of freight and other transportation all available routes of communication and transportation equipment should be used in the most expedient combinations. The principle of their combined and mutually coordinated use fully preserves its importance both in theaters of military operations and in the interior regions of the country.

In this connection it is necessary to establish which specific combinations and forms of coordination of various types of transport will be most rational and in accordance with this develop basic means for the primary support of the operational capability of systems in strategically important sectors. Military strategy and the theory of military communications are involved in the solution to these problems.

The greatest difficulty in the organization of transport work arises in connection with the destruction of objectives on railroads and inland water routes. There are varied means for overcoming such barriers. The selection of the most rational of them depends on many conditions of the actual situation. However, in any case the factor of time, which usually is determining, will play the main role.

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Thus, for example, to restore destroyed locks and reestablish through traffic of ships along a canal in the beginning period of war will not be possible primarily because of lack of time. For this very reason it will not be possible in a timely manner to restore a blocked tunnel on a railroad line and open it again for the through traffic of trains.

In this period railroads can be reconstructed for the through traffic of trains through some destroyed junctions, and temporary railroad bridges could be built (varieties of short term construction, floating, etc). Productive work at time will be made difficult by obstacles, fires and the high level of radiation. It should also be taken into account that the traffic capacity of temporary installations and structures is usually not so great. For example, in re-routing train traffic because of a destroyed bridge from a double-track span to a single-track temporary detour provided by a short-term construction bridge, the traffic capacity will reduced several times in comparison with that over the direct route prior to the destruction. If, on the detour, it is required to use another and less powerful type of locomotive or to decrease the weight of the trains then the traffic capacity will be reduced even more.

Depending on the conditions of the situation in the interior regions of the country and in the theaters of military operations, over various sectors of the transportation system and for different distances there can also be made direct rail, motor vehicle, river and air movements, and also troops can be moved on foot. In theaters of military operations and in regions of combined operations of ground troops, movements of large and individual units will be completed on foot and the transportation of materiel by means of through services, with parallel use of motor vehicle and air transport and fields pipelines.

As is known, armament, composition, organization, military art and also strategy depend primarily at a given moment on the degree of production attained and on the means of communication. With the development of railroads, the increase in their traffic capacity and in the freight carrying capacity of rolling stock, tempos and volume of military transport increased and the concentration of troops and their supply was facilitated.

The specific influence of the condition of the railroad system on the time periods of strategic deployment of troops can be seen in the example of Germany and Russia during the first world war. Germany was able to complete strategic deployment of the 13th day after the notice of mobilization, whereas Russia, because of the lack of a developed railroad system and front line roads along the western border, only on the 24th day. It is natural that already at that time both the Russian and the German general staffs were very interested in planning the development of the communications network on the most important strategic axes. This is natural because the construction of railroads on the axes of probable operation of the main strategic directions during that time, as, on the other hand, now also, was one of the main phases of preparation for

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war. This, if it can be so expressed, is the transport support of specific strategic plans and intentions, whereas the effort directed at increasing traffic capacity of all roads in the country, the improvement of rolling stock, etc, to a definite degree is the result of the general requirements of strategy.

And what now is the influence of strategy on the character of development of the transportation system and transport in general?

Thorough research of this problem is considerable practical interest. In this regard it is necessary to consider the constant growth in the volume of transport work and under new conditions. It is sufficient to recall the characteristics of transportation support for the forward movement of large troop formation, so changed in their composition. For the accomplishment of this important task all types of transport are now involved, and, of course, this situation indicates an entire complex of problems, the solution to which is possible only by long-term and timely preparation.

During conditions when the continental armed forces consisted only of ground troops and the routes of communication were very poorly developed, military operations were conducted primarily along roads. The role of the old Smolensk road in the Patriotic War of 1812 is generally known as well as the memorable strategy of the "echeloned" war of 1918-1920. At the present time in their sectors of operations troops will strive not only to use the entire network of existing routes of communication, but also lay new routes wherever they are required. For now, as never before, the strategic mobility of troops and their capability to accomplish swift regroupings and maneuvers are conditioned by the operation of rail, motor vehicle and other types of transport. The success of the development of contemporary operations in any active military theater depends directly on the condition of routes of communication and transport equipment.

And what about reviewing the changed military requirement for materiel? It is not simply the fact that it has sharply increased. Completely new types of supply loads have appeared requiring the development of special rolling stock. The change in the composition of supply loads has also had a marked influence on the development of transport. During the Great Patriotic War., as is known, by volume the shipment of fuels and lubricants was less than that of other freight. Now, in connection with the completion of the process of mechanization and motorization of troops, the volume of fuel transport has increased so much that previous means of transporting it are no longer satisfactory. Experience itself gave rise to the problem of the development of stationary and field pipelines, soft containers and other equipment facilitating the delivery of the tremendous quantity of fuel from supply bases to the troops.

In such manner, the revolution in the military field giving rise to a change in strategy has also placed new demands on the preparation and

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development of transport which required a sharp increase in its vitality and readiness to support military operations characterized by the broad scope, great depth and high tempos of their conduct.

In the article have been reviewed several points characterizing the reciprocal influence of strategy and transport. Now it is generally recognized that strategic plans will be practical only when they take into consideration important economic factors including the condition and capability of the transportation system and transportation agencies. Together with this, on the basis of newly equipped transport and the appearance of new lines and technical equipment, there can be and should be introduced appropriate corrections in strategic plans.

ON MEANS and METHODS OF PROGRAMMED TEACHING

Book Review by Engr Col N. BAZANOV and Engr Lt Col V. KOSHUTIN

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Questions pertaining to programmed training have recently been given increasing attention of both scientific workers and teachers. Interest in this subject is explained not only by the need to seek new means and methods of teaching, caused by the tumultuous development of science and technology, and by the ever increasing volume of knowledge, but also by the fact that very hopeful results have already been attained in this field.

A number of specialized works were published on the theory and practice of programmed teaching. They include the book by A. V. Prokof'yev. The author, a military pedagogue, presents the reader with materials pertaining to the practice of programmed teaching in military educational establishments and in the units.

The book reviewed here is devoted not so much to theoretical questions, as to the means and methods of programmed teaching, i.e., to the practical aspect of this field and, naturally will evoke the interest primarily of those who are directly engaged in teaching, and are vitally interested in increasing the effectiveness of teaching.

Proceeding from the fact that teaching is a controlled process, the author briefly cites the shortcomings of the ordinary teaching system, which is primarily of a group and mass nature, where the weak reverse link between the student and the teacher does not permit sufficient control over the assimilation of material by the students. The book provides a very competent description of the essence of programmed teaching as a process in which the present day group and mass teaching processes are given individualized features and incorporate elements of constant control over the assimilation of various material. From the definition of the essence of programmed teaching it is not difficult to reach the conclusion that the widespread application of such teaching will allow a sharp increase in the effectiveness of group and mass methods of teaching.

Principal attention in the book under review is concentrated on the means and methods of programmed teaching. After defining certain prerequisite initial concepts, the author describes the methods used in preparing teaching materials for the programming of textbooks and teaching machines, and explains two main ways of arranging materials for the textbook or machine (linear and ramified program). Some chapters are devoted to a description of various models of machines designed in various educational establishments of the Soviet Union and abroad, and to a classification of programmed textbooks and teaching machines. A special chapter describes an automated class and teaching equipment.

In conclusion the author attempts to summarize the experience acquired in the utilization of programmed textbooks and teaching machines both at home and abroad. By way of an illustration of programmed teaching he cites some statistical data concerning the progress of the students enrolled in conventional and programmed

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There is no doubt that this book will be of considerable help in the development and perfection of the means and methods of programmed teaching and will therefore evoke a certain amount of interest in the reader.

We would like to direct the readers' attention to certain elements of a general character that are important in order to understand the principles and the role of programmed teaching.

Until recently there existed different viewpoints regarding the role of the methods of programmed teaching, regarding the possibilities of programmed textbooks and particularly, of the teaching machines. Some tended to consider that the creation of sufficiently complex teaching machines, with a high level of automation, would permit the automation of all aspects of the teaching process, including final examinations and the planning of the teaching process itself. Here, it appears to us, it is necessary to caution the teachers against an over evaluation of the role of automated teaching, which reduces the instructor to the position of an operator of an "automatic teaching machine." With regard to this question we hold the view that machines and programmed textbooks serve to supplement and improve the pedagogical process. The assertion that "the automatic machine teaches man" as a paraphrase of "the automatic machine controls the blast furnace process the programs for the teaching machines are compiled by the teacher. Furthermore these programs required considerably more creativity than that required in the conventional teaching system.

With respect to this question the author of the book under review adheres to an opinion with which it is impossible to disagree: "Teaching machines, programmed textbooks and the entire method of programmed teaching merely supplement and improve the pedagogical process (italics ours, reviewer) of which the teacher is an integral part. The role of the teacher remains a leading one. His functions are made somewhat more complicated, and require a different approach to the teaching process, particularly in the preparation and conduct of classes involving the use of teaching machines or programmed textbooks" (page 26).

Moreover, methods of programmed teaching can hardly be considered universal and applicable to all the disciplines. The sphere of their effective application, apparently, will be limited to the so-called "exact sciences." The utilization of machines, let us say, in the study of such scientific disciplines as philosophy, and minor strategy will inevitably lead to the "cramming" of the students with simplified, schematized answers, and, consequently, will result in the impoverishment of knowledge. This is mentioned by the author in passing at the end of the book. It would, however, be useful if the spheres of application of programmed teaching would have been defined not only with regard to different disciplines, but also (even if hypothetically) with regard to the different segments of those disciplines where the new methods are generally effective. The foregoing should also have been substantiated with examples.

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A. V. Prokof'yev also does not shut his eyes to the shortcomings of the new teaching method: the certain probability of an accidental "guessing" of the correct answer when the correct answer must be selected from a few alternative answers; the difficulties involved in the preparation and programming of the material for teaching; the unnecessary expenditure of the students' energy on parasitic operations, and other shortcomings. It must be assumed, however, that with a wise approach to the matter these shortcomings will be eventually eliminated as experience is accumulated.

Indices such as progress of the students, "speed" with which the material is assimilated by them, the time spent by the teacher on the programming of the material, the skill level of the teacher, as well as the cost involved in the teaching of one student, should be the criteria for determining the effectiveness of programmed teaching. All this, naturally, is based on a comparison with the conventional teaching system

The author, utilizing the accumulated statistical data, shows the doubtless advantages of programmed teaching over conventional teaching methods. The criteria he chooses, for evaluation, however, consist only of the progress of the students and the time spent on the course or part of a course. Let us quote from the book: "... In one of the institutions of higher education the average grades earned in experimental courses on pulse engineering and propagation of radio waves, which were based on the programmed method of teaching, were 0.2 and 0.5 points higher than the grades earned by the control group, while the time spent on the experimental course decreased by 15%-18%. The experiment was conducted during one semester using 52 hours of study material" (page 146). Unfortunately A. V. Prokof'yev does not show the degree to which the teacher's work was further complicated or the increase in the amount of time required for his work with the new teaching method.

On the whole it may be said that the book presents doubtless interest to the military teachers in the military educational establishments, and particularly in the units. This book is, first of all, useful to those who are making the first steps in the field of programmed teaching. The examples of programmed textbooks and teaching machines given in the book are not the only ones in existence now are they mandatory. The creative thought pedagogue can create more perfect devices, which may be distinguished both by the complexity of the programs, and by their design features.

In our opinion, however, it is necessary to beware of haste in this matter, to avoid groundless implementation of programmed teaching devices into any teaching process. It is also important to avoid the vulgarization of the very idea by creating "automatic machines" with a selective system of answers.

Each step must be checked out in practice, so that a true perfection of the military teaching system would yield a real increase in the effectiveness with which highly skilled military specialists are trained.

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Notes:

1. A. V. PROKOF'YEV, Programmirovaniye obucheniye, mashiny dlya obucheniya (Programmed Teaching. Machines for Teaching), Military Publishing House, 1965, 164 pages.

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SOME PROBLEMS IN THE METHODOLOGY OF SOVIET MILITARY-HISTORICAL SCIENCE

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by Col V. SOLOV'YEV

The Communist Party, true to the precepts of Lenin, pays great attention to the development of science. It develops its policies on a strictly scientific basis, guided by objective laws of social development, collective reasoning, and the experience of the masses. The Party Program points out that social sciences constitute the scientific foundation of the development of society. The application of science is becoming a decisive factor in the tremendous growth of productive forces. The role of science in the whole life of society, including the military field, has grown to a tremendous degree. Without its comprehensive development, any field of human activity is condemned to stagnation.

The necessity of a scientific approach to the solution of the problems of life, and the difficulty of these problems, places on workers on the theoretical front great and responsible tasks. The party demands of scholars that they permit no manifestations of subjectivism in their activity, that it be based strictly on objective data, and that they carefully check their conclusions in practice.

Under present conditions, when the development of science insistently demands the extension of knowledge, broad generalizations, and ever improved methods of analysis, Marxist-Leninist methodology has assumed especially great importance. As is known, the achievements of science are directly related to the methods of acquiring knowledge, the development of which assures the success of subsequent concrete research. And it is perfectly natural that in recent years problems of methodology have attracted great attention and have become the subject of discussion at a number of authoritative scientific conferences. There is no doubt of the positive significance of the conference of military historians held in March, 1965, devoted to the methodology of military-historical research, and of the revised report of Col A. N. GRYLEV on the subject discussed, published in Voyenno-istoricheskii Zhurnal (Military-Historical Journal), No 7, 1965. But this is only the beginning of a great and extremely necessary work which it is necessary to carry on a wide front.

For several decades the decisions of the party on military matters have been guided by Lenin's thesis that "without science it is impossible to build a modern army" (Complete Works, Vol 40, p 183). This statement is especially true now, when the world has witnessed a rapid development of science and technology, when a revolution is taking place in military affairs.

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Problems of the defense capability of the country and of the organization and conduct of armed conflict have become immeasurably more difficult in our era. Only a strictly scientific approach to military problems, and a decisive overcoming of voluntarism and subjectivism assures the making of correct, well-founded decisions. In this connection, there is an increase in the importance of creative mastery of dialectical materialism as the methodological basis of Soviet science, and of the role of research on problems of the dialectics of knowledge and the dialectical forms and methods of thinking.

The tremendous experience of more than a century irrefutably confirms that the Marxist dialectical method correctly reflects the objective laws of the material world, and therefore serves all sciences, including the military one, as a perfect instrument for the cognition of reality. The indisputable truth is that the study of the very complex phenomena of war and military affairs must be conducted in accordance with the laws of materialistic dialectics and be based on them.

Marxism-Leninism is for Soviet military science and its constituent part, military history, a world-outlook and methodological foundation. The strength of Soviet military science is rooted in its resting on the most advanced philosophy of our time. However, Marxist dialectical methodology does not replace the methods of other sciences, but is their common philosophical basis and serves as an instrument of cognition in all fields. The methods of military science, including those of military history, have a more particular, applied character: they are concerned with concrete ways, measures and means of obtaining and processing factual materials. Methodology and method are closely linked with each other. The methods of acquiring knowledge, used by the different sciences, are extremely varied. Among them are some that are common to many sciences, but there are also specific methods for each separate science.

War, as an extremely complex social phenomenon, is studied by many sciences. Military science studies the laws specifically of armed conflict, which develop both on the basis of its dependence on political, material and psychological conditions, and as a result of the interaction of causes and circumstances peculiar to armed conflict itself.

Soviet military science includes a system of sciences: the general theory of military science, the theory of military art, military-historical science, the theory of training and indoctrination of troops, military administration, military geography, and military-technical sciences. Each of these has its own range of problems to be studied and its own particular methods of research.

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Scientific research in military science is progressing on a wide scale. A great many different problems, far removed from one another, are being studied. Even in a single field of knowledge many problems are being studied which are not closely connected with one another and require different approaches, different ways and methods of research, and various combinations of them. Moreover, the methods of research are determined not only by the subject studied, but by the goal and expected result of the research.

Thus there cannot exist a single, universal method of research for all the branches of knowledge making up military science. The choice of methods, ways and means of acquiring knowledge is a different and important process on which the results of the work depend to a great degree. Some methods of research can be successfully applied in a number of the fields making up military science, and they may supplement one another. Others can be used only in a certain field. In the theory of military art, exercises and maneuvers, command-and-staff exercises, war games, etc., are used as such specific methods of research (they simultaneously serve as operational training). They cannot always be applied in military-technical sciences. At the same time there are inherent in military science such methods, common to many sciences, as the method of observation, the comparative method, the mathematical method, and logical methods.

The radical changes taking place in military affairs require not only an acceleration of the tempo of scientific research, and in many fields a change in its direction, but also the improvement of old, and development of new, methods of research. The need for this arises from the internal logic of the development of sciences and from the new practical requirements. The development of science is inevitably accompanied by the improvement of old and the appearance of new ways of research.

This process has been reflected in many divisions of military science in recent years, but unfortunately, not very extensively yet in military history. It must be said that the methods in this field have changed very little. This is especially intolerable since the subject of its study has undergone great changes. A study of the experience of the Great Patriotic War and of World War II as a whole, in many ways different from wars of previous eras, and the radical changes caused by the post-war revolution in military affairs, which have already become a subject of study for military history, have placed before military history tasks which demand an improvement of its methods.

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CPYRGHT of military art, and the development of the armed forces and military equipment. Its aim is to determine the general principles inherent in wars and military affairs in a certain historical epoch. It studies all these problems in close connection with the political, economic and other factors affecting military developments. Naturally, military history interacts with general history, using its conclusions for evaluating the political essence of wars, the economic potential of the belligerent countries, etc.

The most important component of military history is the history of military art which engages in the study of the principles of the development of military art, and the means and methods of solving strategic, operational and tactical problems.

The task of military history is to generalize, on a strictly scientific basis, the experience of military organization and of armed conflict. Combat experience, gained at the cost of severe trials on the battlefields where the Soviet people have defended their freedom and national independence, serves as one of the most important foundations of Soviet military science and is an effective source of development of military science and of the armed forces. Of great importance is the theoretical interpretation of problems concerning the place of military history in military science, its relation to the practice of military development, and the discovery of the directions in which the creative efforts of military historians should be mainly concentrated.

Speaking about the dependence of the method of military-historical science on the subject of its research, it is necessary to start with the fact that it is a border science--it is a part of civilian history, on the one hand, and of military science on the other. Military history's subject for research is a certain group of facts and laws which are studied by general history, and a group of facts and laws which are the subject of military science. Needless to say, Soviet military history should use both the methods of general history and those of military science. The interrelationship of these methods is determined in each case by the specific content of the subject being studied.

One of the most urgent methodological problems which Soviet military history faces is the correct solution of the problem of the relationship between the historical and the logical in its research. This question is closely connected with the problem of overcoming subjectivism in military-historical science.

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A deeply historical world-outlook is inherent in Marxism-Leninism. Marx and Engels wrote in German Ideology: "We know only one, single science, i.e., the science of history. History can be looked at from two sides; it can be divided into the history of nature and the history of man. But both aspects are inseparably connected; as long as man exists, the history of nature and the history of man will have a mutually determining effect." (Works, Vol 3, 1955, p 16). This formula expresses the idea of the historical viewpoint as the chief methodological requirement and general principle of all sciences.

Lenin firmly emphasized the necessity of an "absolutely historical analysis of the problem of forms of conflict" (Complete Works, Vol 14, p 2), and pointed out that it was most important "to look at each problem from the point of view of how a certain phenomenon in history arose, what were the main stages through which this phenomenon passed in its development, and from the point of view of this development, to see what this thing has become now" (Complete Collected Works, Vol 39, p 67). This Lenin thesis shows better than anything else the place and role of military history in the system of knowledge of military science.

A most important task of military history is the study of those processes and principles which have determined military developments in the past and, in a changed form, continue to affect them under present conditions. The disclosure of cause-and-effect relationships and basic principles makes it possible correctly to understand the process of military development and to foresee the nature of armed conflict.

Marxist-Leninist methodology demands that phenomena be studied in their development and change. It starts from the premise that the most profound theoretical conclusions are attainable if they are based on the generalization of concrete historical material. Logic should rest on history, but at the same time history cannot help resting on logic. A most important principle of the dialectical method is the inseparable relationship of the logical and the historical. The unity of the historical and the logical is of decisive importance for understanding the relationship between the history of some phenomenon and the result of its development. Marxist dialectics perceives the logical as the concentrated theoretical expression of a historical process. The logical method of cognition enables one to see what new thing has come into being, to discover the principles of development, and to develop general concepts and formulas.

At the same time the historical method cannot be presented as just a description of facts. It should disclose the same laws of development of phenomena as the logical method; however, not in abstract, theoretical form-- but, as Engels said, by tracing the "actual development" (K. Marx and F. Engels, Collected Works, Vol 13, 1959, p 497), the concrete events, and the activities of classes, parties, and individuals, and by investigating all these phenomena in the conditions in which they arose and developed.

The logical and historical methods of acquiring knowledge interpenetrate each other. They cannot be opposed to each other. The logical method presumes having recourse, when necessary, to the elucidation of concrete events and facts, while the historical method should disclose the principles of historical development.

It is an intolerable situation when a historian substitutes a repetition of previously approved conclusions and sociological formulas for concrete research work. This results in substituting for analysis of typical facts a one-sided selection of "examples", which gives rise to dogmatism and scholasticism, deprives science of its connection with real life, and leads to the disappearance from historical works of scientific generalizations and conclusions. The materialistic methodology of history provides guidance for research, but is not a means of constructing certain abstract outlines to which historical facts may be adjusted. The role of theoretical generalization in military-historical research should not consist, as it often has in the past, in illustrating certain theses stated by somebody, or in selecting examples confirming laws and principles in military matters which have long been well known. Such "historical research", naturally, does not meet the demands of scientific search for knowledge.

As has been repeatedly pointed out in our military press, a real shortcoming of much of our military-historical literature is its descriptive character; the lack of analysis of events and phenomena, of generalization of facts; a withdrawal from the important problems of military-historical science and the history of military art; and dogmatism. This trend reveals itself most fully in the "insignificant themes" of a number of articles on military-historical matters in the periodical press, and in the insignificance of the subjects of some dissertations being defended, and even of certain monographs. A decisive struggle against the gap between military history and theory, and against an indifferent attitude toward theoretical interpretation of military-historical experience continues to be an essential task of the day.

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Scientific research presupposes the posing of an urgent problem, the answer to which was not previously known. Herein lies the meaning of research work. Only a correct, scientific solution of a problem can provide the recommendations needed by the practice of military development.

It is true that during the postwar years Soviet military historians have gathered, systematized and described an immense amount of factual material on the history of the Great Patriotic War. There have also been compiled basic works like the multi-volumed history of that war, monographs on the most important operations of the past war, research on the history of the military art, and many others. However, there still has not been overcome the lag in analysis and generalization of the many-sided experience of the past war, which is very important for our country and its armed forces.

A correct combination of the historical and the logical has become especially urgent under modern conditions. The rapidly developing revolution in military affairs requires interpretation of its complex processes and their origins.

The use of the historical method in military-historical science presumes the discovery of facts and, on the basis of their description, the re-creation of the most accurate possible picture of the events being studied. Inasmuch as the military historian has the task of tracing the process of development of events, he cannot limit himself to a photographic fixation of any one of them. In other words, in the description of a war, a campaign, an operation, or a battle, he must arrange the facts in their interrelationship with one another and trace their development.

The success of military-historical research is determined at the very beginning by the ability of historians to establish correctly the range of facts which is to become the subject of their study. This is the basis for further theoretical work. Mistakes or negligence allowed here lead to failures in conclusions and generalizations, and cast doubt on the scientific values of the research. Of course, no research in any one field can cover the inexhaustible number of separate facts making up its content. The selection of certain facts and the ignoring of others is permissible and necessary in any research, including that of military science and military history.

Military researchers should be unswervingly guided in their work by the extremely important instruction of Lenin about the necessity for a serious, scientific approach to the selection of facts. In the field of social phenomena there is no procedure more wide-spread and more ill-founded than the picking out of individual facts and playing with

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examples. Mercilessly castigating such procedures, Lenin taught that "it is necessary to endeavor to establish a foundation of accurate and indisputable facts on which one could rest securely and with which one could confront any of those 'general' or 'approximate' arguments which are so misused in some countries in our time" (Complete Collected Works, Vol 30, pp 350-351)

It is difficult to overestimate the importance of this Leninist principle of military science. It, undoubtedly, is one of the basic criteria in determining the scientific quality of a work and the correctness of the conclusions drawn. The slightest departure from it leads to the most undesirable consequences. Proposals based on a one-sided selection of facts do not rest on a scientific basis. They may have the most unfavorable effect on the development of military science, and on practices which are based on such recommendations.

It is necessary to see to it strictly that the factual basis of military-historical research is many-sided and does not miss important facts. However, it also should not be overloaded with a great quantity of insignificant facts.

A materialistic and dialectical approach to the facts being studied and the establishment of causal relations and interrelationships make it possible to establish correctly that necessary "foundation of facts" without which there can be no military-scientific research. In our opinion, military historians must strive to interpret critically and master completely all the specific methods and means of classification and processing of facts which have been developed by the best of their predecessors.

First of all it should be said that study of the experience of the past cannot be based only on favorable examples. A one-sided approach to the study of wartime experience creates a distorted picture and leads to one-sided conclusions and to the embellishing of reality. In this case the sphere of research fails to include the real activities of command cadres, aimed at the overcoming of difficulties and mistakes, at carrying out assigned missions in spite of all obstacles, -- i.e., everything which constitutes the essential part of the organizational capabilities of command personnel.

Military historians, in creating a "foundation of facts" for their research, should be concerned about the reliability of sources used in their work (most often these are written documents), should determine their political trend and establish how complete is the information provided by them and the degree of accuracy and reliability of this information. Historical documents may be a weapon of political struggle. For the researcher it is important to understand in what circumstances the source came into being, and what influence social relations, ideology, and bias or self-interest had on its author.

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In evaluating the reliability of a source it should be determined whether there are any contradictory data in it, or disagreements with other sources. Military documentation presents favorable opportunities in this respect, since the same events are reflected in documents issued by various echelons. Only by strictly considering all these circumstances can the truth of events be established.

The selection of facts depends greatly on the subject of research, its aims, and the level on which it is conducted -- tactical, operational, strategic, or one encompassing the phenomena of war as a whole. In research on problems of the history of military art, in most cases it is necessary to work with documents which describe the conditions in which the battle or operation being studied took place, the composition of our own forces and those of the enemy, their morale and combat qualities, the decisions of the command (our own and the enemy's), and the organization of control; to deal with data on the preparation for a battle or operation, the organization of coordination, and the carrying out of command decisions by the operating units; to work with documents describing changes in the situation in the course of combat operations and the new decisions made by the command on the basis of these changes, the role of arms of troops and branches of the armed forces in the achievement of victory--i.e., the whole complex of data which reveal the results of combat operations both of our troops and those of the enemy.

Just this cursory listing of some groups of facts typical of military historical research shows what a wide range of material it is based on. Obviously this material should not be used in military-historical research in the form of a mass of uncollated facts, but in an orderly, systematic form. Facts in such research are most often set forth in chronological and logical order. And when some problem of military science is being studied, a certain part of the work (the introductory chapter) is devoted to a review of the consecutive development of the problem, i.e., of those stages which preceded its present status.

In re-creating a picture of military events or describing the processes which have taken place in military affairs, the historian places them in a certain order and a certain relationship to one another, and determines the role, place and importance of certain facts. This task becomes more difficult as the scale of the events being described expands. It is easier in describing a battle; it presents more difficulty in describing an operation; and its difficulty greatly increases in setting forth events on a strategic scale, or that of the war as a whole. In this case the researcher deals with a great number of interacting phenomena in the armed conflict and with more complex processes, and has to consider all aspects of the influence of political and other factors on the course of the armed conflict.

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the tasks performed by the historian in recreating a picture of the past. He said: "In the study of history, what troubles and torments the student most is historical perspective, the interrelationship of phenomena, and their relative importance. Being guided by one's personal evaluation, it is easy to exaggerate or underestimate something which one has not experienced personally, and thus the facts may be so presented that what results is not a picture of what happened, but a hallucinatory reflection of one's own imagination, a specter substantiated by documents" (Voprosy Istorii, No 7, 1965, p 210).

In military-historical works, the description of events, situations, and command measures is of great importance and occupies much space. The historical method here does not appear in pure form, inasmuch as the selection, classification and grouping of facts also includes the logical method. Incidentally, Engels pointed out this fact in his definition of historical and logical methods.

Description is the stage of scientific research which prepares for the transition to theoretical interpretation of the material. Without description of facts, it is impossible to explain them, but, on the other hand, description alone does not make a science. Description and explanation in military-historical research are closely interrelated; dialectically, one shifts to the other.

It is not permissible for military-historical research to remain in the stage of description of individual episodes of military history, without going on to generalizations and theoretical conclusions; it must not fail to present a profound revelation of the cause-and-effect relations of phenomena and to trace, on the basis of concrete materials, the effect of the laws of armed conflict, and the laws of the development of tactics, operational skill, and strategy. No matter how conscientiously an author tries to collect and describe his material, unless his work contains some theoretical generalizations, some posing of problems, it will not be of much importance and will contribute relatively little to today's military science and practice.

Along with certain successes in systematizing and describing the events of the past war, there have been substantial deficiencies. Many documents continue to remain outside the field of vision of military historical research. Statistical data on many quantitative characteristics of the past war are in an unsatisfactory state; among them are those describing the scope of the armed conflict. Statistical data provided in the published works are often contradictory. The "mathematization" of military-historical science deserves serious attention. Mathematical methods make it possible to disclose quantitative principles in the phenomena being studied.

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As we know, the importance of computer techniques is rapidly increasing. In many fields of knowledge computers are being used more and more frequently. Unfortunately, this cannot be said of military history, although it presents a wide field of activity for the use of mathematical methods.

Inasmuch as armed conflict is a process involving two sides, the researcher should strive to gain possession of the facts which adequately describe the actions of both sides. However, a major shortcoming of many works of military history is the one-sided exposition of the armed conflict and of the war as a whole. In these works the facts describing the condition of the forces, actions, and decisions of the enemy are analyzed very inadequately.

No substantial improvement in this respect has been noted in recent years. The publication and dissemination among scholars of documents and facts casting light on the planning of the armed conflict by the Nazi German command, the status of the military economy and the psychological potential of the fascist bloc, and the operations of the Wehrmacht and troops of Germany's satellites on the Soviet-German front (which should constitute an important part of the "foundation of facts" in military-historical research)--these, in our opinion, have been accomplished far from effectively. There is a similar situation with regard to the publishing of materials on the politics, economics and combat operations of the armies of the US and Great Britain during World War II.

Until these shortcomings are eliminated, military science in many fields will rest on inadequate data of practical experience, and military-historical thought will not have that broad basis of facts which the development of the military affairs requires. The creation of a system of scientifically well-founded information in relation to problems being studied by military history is an important and urgent task.

In our opinion, the study of facts of military history should be carried on from three viewpoints. First of all, for recreating a picture of the past, the historian examines groups of facts as phenomena. This work is accomplished in the descriptive part of the work on military history, and it is insufficient for a scientific exposition of the subject. Further, using the historical approach, the researcher should give a retrospective evaluation of the facts being considered, i.e., show them as the results of a preceding development. In military-historical works, this is accomplished most often in the introductory part, which contains, along with a description of the circumstances in which the events take place, information on how these circumstances developed (for example, the military-political situation at the beginning of a campaign or

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strategic operation, the operational situation, etc.). And finally, the group of facts being studied must be considered from the point of view of the effect they have had on the further development of events.

The logical method finds widest application in the study of specific problems of military history and the history of military art.

In studying problems of the tactical and operational level, the military historian, on the basis of a study of concrete facts, should give an analysis of the situation of the battle or operation; make a quantitative and qualitative analysis of the forces of the two sides; and determine how correctly the command evaluated the enemy and the capabilities of its own forces, how well the decisions it made met the situation, whether preparations for the operation were carried out correctly, whether all possibilities for the achievement of victory were utilized, what factors promoted or hindered the achievement of victory, and at what costs victory was achieved. The attention of the researcher is concentrated on such problems as the choice of direction of the main attack, the depth, tempo and duration of an operation, the disposition of combat formations and the organization of coordination, the forms of operational maneuver, the organization of troop control, and the logistical support of troops.

In studying one or even several battles and operations, the historian deals with a comparatively limited number of facts, and this, naturally, gives no basis for broad conclusions and generalizations. However, even in such cases his principal task consists of revealing how, in the specific conditions of a particular battle or operation, there were manifested certain laws of armed conflict, and what effect subjective factors had on the outcome of the battle or operation. In evaluating such works, we should proceed on the basis that it is not enough to know the laws in general; it is necessary to follow consistently the nature of their effect and manifestation in the concrete conditions of a battle or operation.

The logical element assures a more profound and diverse character in the study of a number of operations or battles. Here the nature of the generalizations and conclusions has quite different qualities. The wide range of observations makes it possible with more assurance to discover the factors, laws, and those aspects of phenomena which contribute to victory or lead to defeat. A persistent struggle is needed to make military-historical works go beyond the bounds of superficial illustration of already well-known laws and principles.

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In the study of a number of operations or battles the nature of description in works of military history also changes substantially. Their descriptive part rests on a much broader basis of facts and observations, the elements of classification and groupings of facts occupy a much larger place in them, and the comparative method is more extensively used. In other words, in the descriptive part of generalizing military-historical works the elements of logical analysis are considerably more extensive than in works devoted to description of individual battles or operations. Here the relation of the logical and the historical appears in a fuller, more developed, interpenetrating form. The logical method of research has extensive application in the exposition of problems of the history of military art, when, on the basis of factual data, a study is made of the principles in the development of the armed forces and combat equipment and the methods of using them in battles, operations, and in a war as a whole.

Above we have considered some of the typical groups of facts with which a military historian deals in trying to analyze the laws of military actions on an operational and tactical scale. A different range of problems arises in the study of war as a whole or of its separate periods and campaigns, the economic and psychological capabilities of one's own country and of the enemy, problems of the organization and training of armed forces for war, etc. This type of research requires the study and comparison of even more complex and diverse groups of facts. Thus, in studying problems of strategy it is necessary to examine the facts which characterize the inter-relationship of strategy and politics, the economic, ideological, and diplomatic preparation of the country for war, mobilization and operation plans, the training and disposition of reserves, border security, organization of bases and routes of communications, the nature and purpose of war, methods of warfare, forms and methods of command of operational ob'yedineniya, the course of the war on the strategic level, the material base of the war, etc.

In studying the phenomena of armed conflict, the researcher must proceed from the basis that, despite its decisive influence on the course of the war, armed conflict cannot be studied in isolation from other forms of conflict, but that its development and laws are closely related to the politics, economics, and psychological-political life of society, the status of science and technology, etc. The study of the effect of these factors on armed conflict is a most important task of military science, and especially of military history. The laws of armed conflict reflect multilateral relations and processes, and interact with each other. It must be taken into account that the effect of these factors in military operations on various levels is not identical and is exercised through various intermediate links.

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In studying the course of armed conflict and problems of the history of military art, it is very important to reveal the cause-and-effect relation of important phenomena in a battle, an operation, a campaign, a period of war, or in the course of the war as a whole. This, as a rule, requires examination of events in chronological sequence (and the overwhelming majority of works on military history are written in this way), careful consideration of the importance of material and morale factors in the armed conflict, the factors of time and space, the influence of subjective factors on the development of battles and operations, etc. In bringing to light the causes and effect of some event of the war, the military historian must not lose sight of his main goal--the objective investigation of the causes of victory or defeat of troops, both our own and those of the enemy.

Since any of the events studied in relation to a war, an operation or a battle has its own sequence of development and causal inter-relationships, the logic of military-historical research demands that these processes be revealed in the concrete events being studied. The next step in the work should include a generalization of the sum-total of observations, the exclusion from them of what is incidental and not characteristic, the discovery of a certain repetitiveness of phenomena and interdependent relations, and finally, the formulation of a hypothesis.

Military science and its component part, military history (like, for that matter, any other science) cannot do without scientifically based hypotheses. The very process of the discovery of laws of armed conflict and of the relations of interacting phenomena presupposes the presentation by the researcher of certain hypotheses, of well-founded suppositions, based on the study of facts. In further work and in the consideration of a wider range of facts, they provide a certain direction to the research and will be either confirmed or refuted. In the process of discovery of the laws of armed conflict, in searching for the correct solution of the relations between the whole, the particular and the individual, the development of hypothesis is an important and necessary stage in scientific investigation.

Unfortunately it must be admitted that in works of military history the scientifically well-founded hypothesis is rarely encountered. This applies equally to dissertations on subjects of military history, including those for a doctor's degree.

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it, the author admits the possibility of its being mistaken. The real enemy of science is dogmatic certainty of the absolute truth of hypotheses, refusal to test them in practice and against new facts. And this is a direct route for the entry of subjectivism into science, capable of doing serious harm to military history. The scholar must be a strict judge of his own hypotheses and generalizations. Dogmatic conviction of the absolute truth of a stated proposition leads to curtailment of scientific search, to stagnation of thought. Dogmatism is the enemy of science. It goes hand in hand with subjectivism, being, essentially, its opposite side.

A specific feature of military-historical works on a tactical, operational or strategic level is the fact that problems of military art have a prominent place in them, and that they analyze the subjective activity of commanders. In the solution of this complex problem, the logic of military-historical research requires both consideration of the important objective factors affecting the course and results of the armed conflict and the war as a whole (of which we have spoken above), and careful analysis of the activity of a military leader.

It is very important to trace in historical facts the role of the subjective factor of the conscious, purposeful activity of the people's masses in the course of a war. Turning possibilities for victory into reality in a battle, an operation, or a war depends much on the actions of the commander. The subjective factor can in large measure affect the objective conditions for waging the armed conflict.

In this connection it should be stressed that with the growth of the power of weapons the influence of chance on the course of the armed conflict has likewise increased. Correct consideration of this factor is of special importance for the initial period of the war. Under modern conditions a miscalculation in evaluating the military-political situation on the eve of war, or delay in taking steps to repel aggression, can lead to extremely serious consequences and fatally affect the course and even the outcome of the war.

This situation is directly related to the work of the military historians. It is no secret that in many military-historical works very little attention is paid to the creative activity of the military leader, to his decision-making process. And this is of very great importance for the development of tactical, operational and strategic thinking. In this respect, nothing can take the place of past experience, especially that of the Great Patriotic War.

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of armed conflict, and also of the principles of military art on which the military leader depends in his practical operations, enables the military historian to bring out how, in a concrete situation, these principles were applied, to what extent they correspond to objective laws, what new constructive ideas the military leader introduced in accomplishing his tasks, what was the result of his actions, and what determined it.

The success of this work depends on scientific honesty, adherence to principle, objectivity and lack of bias, and communist party spirit in approach to the study. The science of military history can be of assistance to practice in the solving of very complex problems presented by the revolution in military affairs only if it provides a scientific analysis of the past, presenting neither an embellished nor a dark picture of it. Historical truth, objective reality, the interests of our people and the building of communism completely coincide.

Mar SU M. V. ZAKHAROV is profoundly right in pointing out the special danger of subjectivism in the military field. He remarks that those historians are justly criticized who, in evaluating certain operations of the Great Patriotic War are guided not by what military-political and strategic significance these operations really had, but by what positions are now held by the people then charged with commanding them. The higher the positions they hold, the more it is said, the importance of the operations has to be built up and emphasized. And so they build them up and magnify them, as though they do not suspect that herein they are departing from the party positions of principled scientific workers and slipping down into the positions of scientific toadies. And it is well known that where toadyism begins, science ends, objectivity ends, and subjectivity takes over" (Krasnaya Zvezda, 4 February 1965).

Marxist-Leninist philosophy proceeds from the premise that practical activity must be based on correct ideas about the external world, and about what is true. It most definitely comes out against subjectivism, against depicting the present or the past from a prejudiced point of view, whether better or worse than actual. The struggle to eradicate once and for all this anti-scientific, harmful and abnormal practice, resting like a heavy burden on military-historical science, is an important task of Soviet military historians. It is necessary to follow consistently the teaching of Lenin: "It is not a matter of who is looking at it, nor who is interested in it, but what it is, independent of human consciousness" (Leninskiy sbornik, Vol XI, p 385). We must remember the angry condemnation by Lenin of the subjective concoction, "the game of examples."

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A firm principle of the Soviet military is the consistent application of the principles of dialectical materialism in theoretical and practical work, and the study of phenomena from the point of view of the interests of workers, which completely coincides with the scientific reflection of reality.

The tremendous and diverse military experience of the Soviet state is of great value for strengthening the defense capability of our country. Treating it in a slighting way is intolerable. Combat experience has been paid for in blood, and can be acquired in no other way. Especially necessary is a comprehensive analysis of the complex processes which took place in military affairs during the Great Patriotic War and World War II, and also in the postwar period.

However, another aspect of the problem should also be soberly analyzed. In periods of rapid development in the military field, it is dangerous to neglect changed conditions of conducting combat operations, and to adapt to them former experience, gained in a different historical situation and on the basis of obsolete combat equipment. While seeing a certain continuity in the development of phenomena and intently analyzing the origins of new methods of armed conflict, a researcher should not allow the routine pattern of old practices to conceal what has developed in the military field as a result of the use of new powerful means of armed conflict and of a change in the situation. The historical principle does not consist merely in seeing the historical roots of new phenomena. It is no less important to interpret correctly the changes that have occurred and the full extent of the difference between the new and the old, to reveal the special features of the new situations, and to utilize to the limit the possibilities of the new weapons, new equipment, new social relations, and changes in the human material. The old experience in the new circumstances has to be revised critically; it should help to understand more deeply the new tendencies, and should not conceal them.

The task of military science is not only to reveal those aspects of past experience which can be useful in modern conditions, but also to promote timely elimination of obsolete principles, methods and means of conflict which were effective in the past but have now become old, fixed routines which hinder the development of military thought and the solution of practical military problems.

The solution of this difficult problem requires a correct understanding of the specific manifestation in military matters of one of the basic laws of dialectics--i.e., the law of the negation of the negation. Marxist philosophy teaches that the new, in replacing the old, retains from the latter everything that is valuable and positive.

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V. I. Lenin said: "Not base negation, not skeptical negation..., but negation as an aspect of relationship, of development, with a positive content." (Philosophical Notebooks, 1934, p 216). The dialectical approach to military developments warns against the under estimation of some phenomena and the over-estimation of others, and against one-sided solutions.

Approaching the development of military affairs historically, we should disclose the processes which have brought the present into being and see the processes which are determining the future. The requirement of Marxist dialectics for a combination of the logical and the historical in military science is demonstrated most fully in just such an approach.

The October, November and March plenums of the Central Committee CPSU, held under the sign of Leninist demands for theoretical and practical work, have occupied an important place in the life of our country. They brought into the life of the Party much that is new and restored a genuinely scientific Leninist style. The Party is consistently eliminating elements of subjectivism and improvisation in the solution of problems of the state, the economy, and party organization. This is giving new, powerful stimuli to the further flourishing of science in our country.

Purposeful, creative work, based on the principles of Marxist dialectical methodology and on a careful study of past experience, and directed toward the solution of urgent scientific problems which are closely tied to modern military requirements, -- this is what is required of military-scientific cadres. The comprehensive study of problems of methodology of Soviet military science would have an important place in the accomplishment of these tasks.

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AN ANSWER TO OPPONENTS

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by Maj. Gen I. ZAV'YALOV

An article "The Types and Forms of Military Operations," published in the January 1965 issue of Voyennaya Mysl', has provoked a fairly wide exchange of opinions on the problems mentioned in it. (Voyennaya Mysl', Nos 6, 7, and 8, 1965). The most serious objections were to the thesis that military operations are divided into only two kinds, offense and defense, and that nuclear attacks cannot be considered as an independent kind of operation.

Some comments cast doubt on the statement that in a nuclear war a strategic defense is possible, and that the combat actions of rocket troops and PVO Strany troops will take on the form of the corresponding operations [which they support]. There was also expressed the opinion that attacks of naval and air forces cannot be regarded as either offense or defense.

Hence, obviously, it is necessary to explain a number of the theses advanced by us.

First, we refer to our assertion that military operations by their nature --i.e., by their basic, most essential characteristics--are divided into two kinds, offense and defense, and that no other kinds of operations exist in armed conflict.

We start off from the proposition that an attack and its repulse, or offense and defense, are two dialectically interrelated activities, one flowing from the other, two aspects of a single process--armed conflict. They cannot exist separately, one without the other. Moreover, in the operations of both sides there always exist elements both of offense and of defense. There is never offense or defense in "pure" form. Thus, during an armed conflict, in its various stages or in particular regions, water areas, or air spaces, each of the belligerents, while basically carrying on one of the two kinds of operations, at the same time is forced to carry on also the other, even though on a smaller scale. The front as a whole may be attacking, but certain of its armies and smaller units may be on the defensive. On the other hand, during a defensive battle, armies and certain of their units may shift to a counter-attack, i.e., conduct offensive operations. In a battle and in an operation, offensive and defensive activities are carried on simultaneously. In other words, during armed conflict each side has to attack and defend simultaneously, repulse attacks and launch counter-attacks.

In warfare there are the most varied kinds of combat operations: attack and counter-attack, meeting engagements, assault and counter-assault, retreat and pursuit, reconnaissance and security measures. But in all this diversity of activities there are certain common characteristics by which they necessarily belong either to the offense or the defense.

What are the basic and most characteristic attributes of the offense? They are two: the launching of attacks with weapons, and movement of the troops forward. Here the main characteristic, the essential basis of offense is the strike for only by the use of all kinds of weapons is it possible to inflict heavy losses on the enemy and deprive him of the capability of offering resistance. Some of my opponents associate the offense primarily with forward movement of troops, with occupation of the territory of the enemy. In their opinion, without such movement there is no offensive. But everyone knows that the advance is primarily for troops to occupy the most favorable position for the launching of attacks, for taking possession of territory in case of retreat of the enemy or his loss of combat capability as a result of attacks, in order to deprive him of the possibility of using his weapons. In other words, advance of the troops is to a certain degree subordinate to the attack.

In the early stage of development of the military art, the weapons of the armed forces were only cold steel, and in order to attack the enemy, the belligerents had to come together, or one of them occupied a fortified position, and the other had to move up to it. With the development of firearms, the need for such proximity gradually disappeared. The more the range and destructive power of the weapons increased, the less became the need for movement. While even now the infantry, with its weapons of close combat, when on the offensive, is almost always on the move, the artillery makes such shift of position only to change firing positions, when its range is inadequate for effective fire on the enemy. The air force, for launching attacks, changes its airfields even less often. As to strategic rocket troops, their effective range is so great that they need not shift position at all. Thus one of the characteristics of the offensive, movement forward, has disappeared completely for strategic rocket troops.

Defense also has two basic characteristics. the first is repulsing the offensive of the enemy by launching counterattacks on him with weapons, and the second is holding the most favorable positions for combat operations. Here again the attack plays the principal role, for only it is capable of inflicting losses on the enemy and breaking up his offensive. Holding of positions is of subordinate importance. It is required for creating the most favorable conditions for the use of weapons to inflict maximum losses on the enemy as he approaches the defensive positions, and also to protect the defending forces and their combat equipment from the blows of the enemy, using terrain, engineering installations, and various means of camouflage.

thus the main characteristic of both offense and defense has been and still is the attack. The difference between these two kinds of operations consists in the ways in which the attacks are launched and the means of destruction are used, determined by the aims of the armed conflict.

Disputing this thesis, i.e., that armed conflict is a two-sided process characterized by a combination of offensive and defensive operations, Gen V. PETRENKO asserts that what is typical of modern conditions is not offense and defense, not attack and protection against it, but attack on the attacker, using primarily nuclear weapons.

There is no doubt that in a future war attack on the attacker may prove to be the basic, decisive method of operations, especially at the beginning of the war, since strategic nuclear weapons are already in their launching positions and ready for immediate use. But even in this case, when both sides simultaneously begin extensive offensive operations, using nuclear weapons, defense as a form of armed conflict does not lose its importance.

It is quite obvious that attack on the attacker cannot continue very long. There can be one of two outcomes of such a conflict: either one of the sides will be completely overwhelmed, and the war will end with that, or it will suffer such losses that it will be much weaker than its enemy and will be forced to adopt on a large scale defensive methods of operations. Moreover, the very process of attacking the attacker is not completely devoid of defensive activities. For example, rocket troops, in order to maintain the capability of launching attacks on the enemy, must themselves be dependably protected and secure from his blows from the air. And this requires a well-organized, strong air defense, and the building of well-protected launching positions. In a nuclear war between sides relatively equal in strength, that side will have the advantage which uses its nuclear power with the greatest effect, best organizes its protection against the nuclear attack of the enemy, and is able to repulse his attacks with greater skill. Therefore it would be incorrect to think that in a nuclear war there is possible only such a combination of kinds of operations as an attack on the attacker, or an offensive against the side on the offensive, and to deny the possibility of other combinations--for example, an offensive against the defender or an offensive against (pursuit of) a retreating enemy. There are no bases for thinking thus. Even in nuclear war, offense and defense will be used in the most varied combinations.

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Incidentally, the attack on the attacker is not something new, or characteristic only of nuclear war. It is nothing other than the simultaneous shift of the belligerents to decisive offensive operations with the aim of most quickly using their weapons for inflicting attacks on the enemy. As a result of such operations, there take place meeting engagements, which are well known to us from past wars.

Continuing to develop their objections on this matter, GEN PETRENKO and some others think that the concepts "offense" and "defense" are applicable only to the operations of ground forces. But to say this is to deny the obvious situation that in the air and on the sea the opposing sides are also attacking each other and resisting attack. Just as on land, the armed conflict in the air and on the sea is nothing other than the launching of attacks and the repelling of them by the two sides, i.e., offense and defense. And although N. V. YUNENKO says that the attack is not necessarily a constituent element of offense and defense, we cannot imagine either an offensive or a defense without attacks, any more than we can imagine assaults (udary) outside of an attack (napadeniye), or defense without repulse of attack. This situation is equally true for all kinds of armed forces and for all levels of military operations, tactical, operational, and strategic.

Of course, offense or defense for each branch of armed forces has its own characteristic features. But the main, basic features for these kinds of operations are common to all of them.

Showing the "inconsistencies" of our positions on kinds of military operations, some of my opponents state that under modern conditions strategic defense is not applicable. Thus, in the opinion of PETRENKO, an attempt to apply in a rocket and nuclear war "defense on a strategic level would inevitably lead the armed forces, and consequently the country, to defeat." (Voyennaya Mysl, No 6, 1965, pp 26-27). Approximately the same point of view is held by Mar Su V. SOKOLOVSKIY, Gen M. CHEREDNICHENKO, and Col. V. LARIONOV (Ibid, pp 27-34).

However, these views, as can be concluded from the comments received, are probably the result of their authors considering the concepts "strategic defense" and "defensive strategy" as identical; with this, of course, it is impossible to agree. These are completely different categories. Defensive strategy means refraining from active offensive operations. It is erroneous in its basis and unacceptable to us. Strategic defense determines only the scale on which this form of operation may be undertaken in a nuclear war, without it being necessary at all that the armed forces as a whole carry out strategic defense.

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The military doctrine of the Soviet Union, in its political aims, never has had and cannot have an aggressive character. Our country has never attacked anybody, and does not intend to attack anybody. A war of conquest is alien to it, as it is to all the socialist countries. But this does not mean at all that in a war the Soviet Union would conduct only defensive operations. If the imperialists commit an act of aggression against us, we will unleash the most decisive, active offensive, using all the military might of our armed forces. The enemy's attack will be answered by us with an attack of still greater force, using to the limit the offensive potential of our armed forces, which has immeasurably increased with the development of nuclear weapons, for a decisive and quick defeat of the aggressors. This constitutes the basis of our strategic concepts.

At the same time we cannot underestimate strategic defense, either. Its role in modern war arises from the necessity of accomplishing that very important, primary mission of the armed forces of frustrating the nuclear attack of the enemy.

Of course, strategic nuclear weapons have a special place in accomplishing this mission. They primarily and mainly are called upon to destroy the nuclear weapons of the enemy. But nuclear strikes at the enemy's means of nuclear attack can scarcely achieve their complete destruction. These means are dispersed over great land and water areas, are well protected under ground and under water, and a part of them under any circumstances will go into action. So the destruction of them in flight will be a basic element in modern strategic defense. In other words, strategic defense in a nuclear war is primarily air defense (antimissile, anti aircraft, and anti space), to be carried out over the territory of a whole country.

In speaking thus about strategic defense, we at the same time emphasize its exceptionally great importance for the defense of the state, we show that a tremendous role it will play in a future war, what an important place it will have among all the other methods of operations, and we call attention to its very great spatial dimensions and to the participation in it of a great quantity of men and equipment. And this does not at all distort the concept of "strategic defense", about which V. PETRENKO is worried:

At the same time, it by no means follows from these propositions that defense can be the predominant form of operations. But apparently SOKOLOVSKIY and CHEREDNICHENKO consider my statements to mean just this when they write that they are deeply convinced that "if either of the sides were to carry out strategic defense (even if this is meant to apply to the activities of PVO Strany troops), it will inevitably suffer defeat."

It is difficult to concede that they reject strategic defense altogether. This is confirmed by the following position stated by them: "Now both sides will attack simultaneously, and first of all with the principal instruments of warfare--rockets and nuclear weapons, and likewise they will simultaneously defend themselves, primarily by the means of anti-air and anti-missile defense. They will also carry on other military operations." (Voyennaya Mysl', No 6, 1965, p 28). Consequently there will be both offense and defense, with defense not on a tactical or operational level, but on a scale of the whole country, with the participation of all the PVO troops or a great part of them, with the aim of repelling a nuclear attack of the enemy. And you cannot call such a defense anything but "strategic."

Certain doubts expressed by A. YEKIMOVSKIY can hardly shake the correctness of this position. He thinks that from the point of view of its mission the composition of the participating forces and weapons, and the size of the area involved, anti-air defense is on a strategic level. But since the operations of PVO troops are divided territorially, they may take place at various times and in various regions, and their principal efforts cannot be directed against the main grouping of the enemy; consequently, anti-air defense cannot be included in strategic operations.

However, as is known, primarily strategic operations are defined by [their] strategic purposes, by their role in the total system of armed conflict, by the participation of a large number of ob'yedineniya and soyedineniya, and by great dimensions as to area. From this point of view there can be no doubt as to the strategic nature of the operations of PVO troops. As to their being separated in time and space, they do not lose their strategic significance from this, especially since it is incorrect to assume that the principal efforts of the PVO troops cannot be directed against the main forces of the enemy. This thesis is refuted by all combat experience. For destruction of the main grouping of the enemy in the air, there are always concentrated such PVO forces and weapons as are necessary for such a purpose.

We should like to note again that there can be strategic defense not only against missiles, space satellites and aircraft, but also in the land theaters of military operations and the sea and ocean areas contiguous to them. And this is entirely natural. If one side conducts a strategic offensive, the other side is forced to shift to a defense on a corresponding scale. This position would be true even if the war should begin with an attack on the attacker. In this defense large formations of all branches of armed forces would participate.

In objecting to our theses about the kinds of military operations, some of the opponents rank the nuclear attack along with offense and defense, calling it, too, a kind of military operation. But these are magnitudes of a completely different order. As may easily be gathered from everything said above, they cannot be combined in one concept. While offense and defense are different aspects of one and the same process--armed conflict, the nuclear attack is a qualitative characteristic of this process, indicating by what means and methods the armed conflict, i.e., offense and defense, will be carried on.

Attacks by strategic nuclear weapons will be launched first and foremost in the interests of the main kind of operations of the armed forces, by which strategy counts on achieving the aims of the war. This kind of operation, undoubtedly, will be offensive. And consequently its decisive force must be strategic nuclear weapons. However, this does not exclude the possibility of launching nuclear attacks also in the interests of defense.

To regard the strategic nuclear attack as an independent form of military operations on a par with offense and defense would be to contradict the dialectics of armed conflict as a single process--attack and its repulse, offense and defense.

In the light of what has been said, it must be admitted that our attempt to regard the war in the ether [radio warfare] as an independent kind of military operations is unsound, and should be rejected as mistaken. The war in the ether basically has the same two kinds of operations--offensive and defensive; it is not carried on in isolation from the combat operations of the armed forces, but is an inseparable part of them, and serves the interests of the defense or the offense.

We should like to say a few words about the forms of military operations.

A. YEKIMOVSKIY objects to the statement that the actions of PVO Strany troops will be carried out in the form of different operations (operatsii). He gives as his reasons the fact that "the actions of PVO Strany troops take place usually as independent ones, carried out by separate soyedineniya and, less frequently, by ob'yedineniya, and are of local importance. Therefore the PVO Strany troops carry out not operations, but combat actions, which take on the form of an operation only when an operational ob'yedineniye has a compact distribution [of its forces], covering a nearby group of major rear-area targets or of troops." (Voyennaya Mysl', No 7, 1965, pp 19-20). But this reasoning cannot be accepted as well-founded. What indicates an operation is primarily the operational or strategic nature of the aims of the operation, its importance in performing the missions in a given stage

of the war, the participation in it of operational ob"yedineniya of one or more branches of armed forces, and the large area involved, and in no case is it the compactness of disposition of operational ob"yedineniya. Moreover, we cannot agree that the actions of PVO troops are carried out by separate soyedineniya, less often by ob"yedineniya, and are of local importance. Many operational ob"yedineniya, not only of the PVO Strany troops, but all the PVO resources of the ground forces, navy, and fighter aviation, may simultaneously participate in repelling enemy attacks from the air. The combat operations will be conducted over immense areas and be of exceptionally great national, and not just local significance. The combat capability of the armed forces and the ability of the state to perform its vital functions will greatly depend on the successful repulse of a nuclear attack of the enemy.

From the point of view of basic characteristics, the actions of PVO Strany troops, must be considered as taking the form of an operation. And, despite all objections, they are usually so planned. As to the term, "combat actions", it does not and cannot express any kind of form. It is too indefinite and is used for a general designation of the activities of armed forces, without regard to their scale or kind.

PETRENKO writes: "In missile and nuclear war there are such logical forms of strategic operations as strategic nuclear attacks, the strategic offensive in a theater of military operations, combat actions of PVO Strany Troops, and also the use of special forces and equipment in space" (Voyennaya Mysl', No 6, 1965, p 26). It appears to me that the author simply does not want to distinguish between the kinds, levels, methods, and forms of actions.

In conclusion, we should like to express our deep gratitude to all the readers who have participated in the discussion of this vital subject, those who have supported and refined the theses set forth by us, and particularly those who, from their own points of view, have criticized them. There is no doubt that the criticism has helped both the author and many readers to analyze and correctly understand the problems raised in the article under discussion.

CIA FDD TRANS NO 955

SELECTED TRANSLATIONS FROM

Approved For Release 2000/08/09 : CIA-RDP85T00875R000300090011-4
"VOYENNAYA MYSL'", NO 10, 1965

25 MARCH 1966

FDD TRANS NO 955

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by Rear Adm (Ret) K. ZOLOV

Almost every time that new weapons are developed, there appear opinions that we must immediately give up existing tactical, operational, strategic or even general military views and work out essentially new concepts. And, on the other hand, frequently attempts are made to reject, or at least to belittle, the importance of the new weapons. But century-old experience has shown convincingly that these extreme points of a view are, as a rule, wrong. It is not only a fact that the new for a certain period of time exists along with the old, but mainly that the old, as well as the new, always represents a diversity of elements, connections, and relations of different degrees of importance and stability. If some of them have no special roots in practical life, others, on the contrary, rest on very firm ground. Finally, there are certain laws of long-term or even permanent effect. Incautious attempts to reject them off-hand can do nothing but harm. Therefore, major reorganizations in the armed forces are usually carried out very circumspectly.

From these standpoints, the article of Maj Gen I. ZAB'YALOV seems timely and useful. Welcoming its appearance, and the many replies to it, we also should like to make certain observations on the problems considered.

First of all, we cannot agree in principle with ZAV'YALOV's idea of ranking as a military operation (along with offense and defense) the "war in the ether," i.e., phenomena on an entirely different plane.

It is interesting to follow the argument of the author. "Of course," he says, "in this kind of operations we shall encounter the same offensive and defensive, for it is impossible to imagine the war in the ether apart from the interests of the offense or defense. But, "follows the antithesis, "the fact is that this war is carried on simultaneously both in the interests of the offense and the defense." And, concludes the author by way of synthesis, "it may attain such development that in certain cases it will dictate the nature of the operations of the armed forces of the belligerents, and from this point of view will take on a certain independence" (p22). (Reply to the Article of Maj Gen I ZAV'YALOV, "The Types and Forms of Military Operations", Voyennaya Mysl', No 1, 1965) [Footnote presumably belonging to this paragraph, but not keyed to anything above.]

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whether he is talking about the defensive or offensive nature of radio warfare itself, or about the military operations (tactical, operational, or strategic) which it is supporting at a given moment. The fact is that this warfare almost always includes simultaneously both "offensive" operations (interfering with the radio communications of the enemy and finding out about his operations and intentions) and "defensive" operations (protection of one's own radio communications from enemy interference and intercept). On the other hand, the whole complex of radio warfare, as the author correctly states, is carried on both on the offensive and the defensive. We only want to emphasize that whether it be one or the other, i.e., more offensive or more defensive, is by no means directly related to the operations it is supporting. Depending on circumstances, radio warfare may tend to be offensive on the defense, and be predominantly defensive on the offense.

Finally, it is true that radio warfare "in some situations will dictate the character of the operations of the armed forces" in warfare at one level on another. But this applies to other forms of support operations as well--for example, to intelligence and supply. But from the fact that the results, say, of intelligence may permit us to move over to the offensive from the defensive, or, on the contrary, make us take a defensive position, does it follow that intelligence has "a certain independence" and should be considered one of the kinds of military operations--in other words, be placed on the same level with the offensive and the defensive? Of course not.

It is another matter that radio warfare represents a new phenomenon of very great importance which, in comparison with the time of its appearance in World War I, can now play a tremendous role, all the way up to the strategic level. If one side or the other should invent a means of incapable, absolute effect on all the radioelectronics of the enemy, this would amount to deciding the outcome of the war as a whole, a decision of a more or less offensive nature, but possibly, in some circumstances, even more or less defensive. But, in the first place, such a thing is practically impossible, and in the second place, even in this hypothetical situation, everything remains as it is; radio warfare is still radio warfare; offense and defense--still offense and defense.

We have dwelt in such detail on radio warfare because the solution of the problem of nuclear attack is based on the same principles, despite the fact that radio warfare is a support operation, and nuclear attack, a foundation of military operations.

strategic? And is there a basis for distinguishing the nuclear attack as a certain special kind of operation, to be ranked along with offense and defense?

"In what does the concept of 'the offensive' consist?" asks Gen ZAV'YALOV (p 16), and he correctly answers: "In the launching of attacks with the use of various kinds of weapons. In the early stages of the military art, these were the lance, the sword, the spear, the bow and arrow; then the firearm of the foot soldier, artillery, tanks, planes, chemical weapons, and, finally, rockets and nuclear weapons. The offensive necessarily presupposes active operations, movement forward toward the enemy, with the aim of attacking and defeating him. And when we speak here of moving forward, we have in mind not only ground troops, but also planes, ships, shells, rockets, etc." The author correctly concludes: "The attack is a one-time act of striking (porazheniya) the enemy. It is intended to accomplish some particular mission, for the attainment of a particular goal, and may be launched by units of any size of all the branches of armed forces."

Thus the attack is one of the basic elements of armed conflict, with this element being very varied in scope. We may talk about fire strikes, or attacks on tactical, operational, or, finally, strategic level, such as, for example, the "ten decisive attacks" of the 1944 campaign on the Soviet-German front. One can also speak of psychological (moral'nyye) attacks. Finally, one may regard a war as a whole as a single tremendous political attack. To be sure, since the development of the firearm, we have often used the word "fire" instead of the word "attack" (as in the combination "fire and maneuver"), but this substitution, for obvious reasons, is permissible only in such combinations. In all other cases "attack" is used and accepted as the broader and more flexible concept.

Thus a gigantic nuclear attack, planned for the beginning of a great war, is a strategic offensive act, regardless of whether it is "initial", "preventive," or "retaliatory." In other words, we arrive at the conclusion that the concepts, "offense" and "defense", on the one hand, and "attack", on the other, are on different planes and must not be confused.

Now it is asked, can the concepts "offense" and "defense" be applied to the operation of all branches of the armed forces? Opinions in the discussion of this question differ. Some think that it is possible to speak about these kinds of operations only with reference to ground troops, since only they move (on the "offensive") over certain territory, or defend certain lines. Others, on the other hand, deny the significance of such a division of operations even for ground troops.

CPYRGHT that, in the first place, the term "offensive" is not applicable to their operations; naval forces conduct neither an offensive nor a defensive, but inflict attacks on the enemy; in the second place, "the nature of combat operations of the navy remains the same both in a period of strategic defense and during a strategic offensive. For example, the navy may land amphibious landing forces or provide artillery support to the coastal flank of ground troops both in defensive and offensive operations." (Voennoye Mysl', No 6, 1905, pp 34-35)

The second statement is more less true, but only for the simple, and already partly referred to, reason that the nature of operations on various levels by no means coincide one with another. For example, a strategic defense may be combined with an operational offensive; the latter may require somewhere a tactical defense; etc. A bullet, says Gen ZAV'YALOV, "is always on the offensive". But this statement is more or less true just because, after all, the offensive or defensive direction of the operations of a higher echelon in most cases are reflected in one way or another in the nature of the operations of subordinate echelons. Thus, landing operations are more often required of a fleet in offensive operations of a front to which it is subordinate; on the other hand, the evacuation of troops from the shore, which occurs on the defense, will almost never occur on the offensive.

MAMAYEV's first statement is not true at all, because every operation of the navy and of each of its sub-units (like, we will add, that of any other branch of service and its sub-units) always has been, is, and will be either offensive or defensive in nature. Thus, escorting a convoy is for the fleet a defensive operation, but an anti-submarine ship, attacking in this operation a submarine which it has discovered, is carrying out a tactical offensive. The forces of a fleet, putting ashore operational or tactical landing forces, is thereby operational or tactically attacking, but at the same time a ship, fighting back at enemy airplanes, is tactically on the defensive.

On this question Capt 1st Rank N. V'YUNENKO supports MAYAYEV. In support of his statements he refers to the operations of the armed forces of Japan in 1941. But this reference, in our opinion, is not well-founded.

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In fact, that the US fleet at Pearl Harbor "was nothing else but an attack (udar)", as V'YUNENKO writes, is true. But his statement that "in these operations ... there was nothing that could be called an offensive--neither seizure of any area against the resistance of the enemy, nor other marks of an offensive operation." (Voyennaya Mysl', No 7, 1965, p 22) is, to say the least, accepting the desired fact as the actual fact. In the Japanese general strategic offensive in the Pacific in the first half year of the war, the attack on the US fleet at Pearl Harbor was nothing other than a major offensive operation.

We will sum up our statements. Rockets and nuclear weapons have completely changed the nature of war, of an operation, or of a battle. But can we conclude from this that we must reject the concepts of "offensive" and "defensive"? Note that we are not rejecting the concepts of "tactics" and "operational art" because of the appearance of these new weapons. And not just because armed conflict with such weapons will not exclude the operations of other branches of forces, for which these concepts will continue to keep their meaning, but also because the use of nuclear weapons will be subordinated to certain strategic, operational and tactical laws(zakonomernosti).

Almost the same thing could be said about the categories of "offensive" and "defensive". First, in many cases they will be manifested in, so to speak, "pure form." Second, the inevitable counter-action (vstrechnyy) nature of many of the operations still will not exclude the possible display in each of them of offensive initiative, placing the enemy in one way or another in a defensive position with all the ensuing, including political and psychological, consequences. And while the politically new social and economic structure always defends itself against the reactionary forces of an out-moded system which seek to destroy it, it always has striven, is striving, and will strive, as the experience of history shows, toward offensive operations, directly in a military sense, i.e., strategic, operational and tactical. And this constitutes one of the important guarantees of its success.

Essentially, Mar Su V. SOKOLOVSKIY and Maj Gen M. CHEREDNICHENKO do not dispute this; they believe that "rocket-nuclear and air-nuclear attacks on economic and political targets, nuclear installations, and armed forces of the aggressor are the most offensive kind of strategic operations of all the kinds that have ever been used in wars. It will have the decisive role in the defeat of the aggressor." (Voyennaya Mysl', No 6, 1965, p 29) Precisely "the most offensive kind," contrasted with the defensive--quod erat demonstrandum

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Finally, the nature of both the offensive and the defense has now greatly changed in most cases, but who would dispute that? However, that is another question to which, incidentally, a great many articles and studies have already been devoted.

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Book Review by Lt Col Ye. RYBKIN

This collection of articles published by Voenizdal in 1965 is made up of materials previously published in our military press on this subject. The articles examine the material-technological and social-political basis of the revolution in military affairs and the principal forms of their being influenced by scientific-technological progress. Much attention is paid to the use of new weapons and to a revision, in connection with this, of a number of principles in the theory of military art; the content of Soviet military doctrine is set forth and its interconnection with military science is shown. In a number of articles light is thrown on the tasks in training and educating troops in connection with the new stage in the development of the armed forces and special emphasis is given to the question of strengthening one-man authority and troop discipline.

The goal of a selection of such articles is to delineate the characteristics of the revolution in military affairs, and to give a more or less general picture of it. It seems to us that the book must be evaluated from this point of view. It must be said that the articles are successfully chosen. At the same time it seems necessary to comment on the substance of certain principles expressed by the authors.

First of all there is the question concerning the essence and substance of the revolution in military affairs. The answer to this question is given in one degree or another in several articles. Thus, in our opinion it is most clearly formulated in the article by Col. P. M. DEREVYANKO: "By the modern revolution in military affairs is implied the entire sum of fundamental changes in the means of armed combat, in the methods of conducting combat operations, in the organization of troops, their education and training -- the sum total of changes which have been realized during the last 15 years in the most industrially and scientifically developed countries, and which are connected mainly with the creation of rocket-nuclear weapons." (p. 101).

From this definition it follows that the revolution in military affairs took place not only in socialist but in capitalist countries, too. Unfortunately, this thesis has not been further developed but it would be highly interesting to show the common characteristics and the principal differences of such a revolution under the conditions of capitalism and of socialism.

The scientific-technical side of the revolution in military affairs is shown fully enough in the book. In this regard the most interesting articles are by Col Gen S. M. SHTEMENKO, Col Gen N. A. LOMOV and Col P. M. DEREVYANKO. It is noted that uninterrupted and ever-accelerating progress in the field of natural and technical sciences promises further discoveries and makes possible the creation of fundamentally new weapons. (p. 95)

RGHT indicated that the era of the development of firearms, in its essential features, had ended (p. 99). This was in the last quarter of the 19th century. Actually the invention of automatic firearms weapons extended this era to some extent, but nevertheless it is already a thing of the past. The development of weapons has found new paths. "It may be stated," it is further observed, "that, speaking in the words of Engels, a new era in the development of weapons, based on the use of the atomic explosion, has come" (p.99). It seems to us that one ought to continue this thought: the era of development of rocket-nuclear weapons, in their essential features, has already been delineated. Their further development probably will not lead to anything basically new in that direction. However, the working out of methods, forms and means of combat is continuing on an ever-increasing scale. Next in turn is the search for a weapon that would be able to reliably and instantaneously destroy rockets with nuclear charges in flight and to hurl them back into cosmic space or neutralize the nuclear warheads of flying rockets (cf. p. 75). Apparently, it is just this kind of research that could bring something fundamentally new into the character of modern armed combat.

Very interesting is the article "military Doctrine and Military Doctrine." We would like to turn the readers' attention to the thought that military science and military doctrine are developing perhaps in a parallel manner but not quite uniformly or similarly. Each one has a dialectic of development peculiar to it, as does every subject. Military science is continually introducing changes in its views. However, military doctrine does not react to individual changes for some time but turns to them only when their quantitative accumulation is definitely felt and requires an abrupt change in basic principles. At the same time military doctrine continues its development even up to the change in its fundamental principles. But, of course, the forms of its improvement must be different from the usual discussions on questions of military science, for doctrine, expressed particularly in such documents as regulations, bears the character of law. On its basis, directives and orders from the leadership of the armed forces are composed and military development in a particular historical period takes place.

Reviewing almost all the questions touched upon in the book we note that they concern only a rocket-nuclear world war. Even the question of the necessity for preserving and developing the old, "classical" branches of the armed forces and types of troops and ordinary firearms is discussed only in the light of such a war. However, one must not forget about the "small wars," which the imperialists are continually waging. It is believed that theoretical thinking ought to take this situation into account and give more attention to the problems of conducting local wars.

The leading role of the CPSU in conducting the revolutionary transformation in military affairs is noted in a number of articles (p. 9, 88-89, 104 and others). "The Communist Party of the Soviet Union," it says in the book, "has opportunely aimed soviet science and technology at mastering the

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energy of the atomic nucleus, has correctly evaluated perspectives in the development of rocket-nuclear weapons and their deciding role in the defense of the country, and has quickly organized their manufacture and introduction into the Armed Forces. The party mobilized our military cadres for mastering the corresponding means and methods of conducting combat operations and for educating and training personnel according to the conditions of modern war" (p. 104).

The authors of the articles in which this question is touched upon underline that the Central Committee of the CPSU and the Soviet government have shown foresightedness and wisdom in their evaluation of the trend of development in military affairs, and have correctly determined the character of a possible war, and have done everything necessary to put the USSR Armed Forces and the defense capability of the country on the level required today.

In the book the readers' attention is turned to the fact that now "as never before, the preliminary working out of all the basic questions of future combat operations, while still in peace-time, takes on the greatest significance" (p. 5). This thesis received its proper development in the article by Col Gen M. Kh. KALASHNIKOV and Col S. K. IL'IN "The Revolution in Military Affairs and the Training of Soviet Soldiers," where special attention is given to the conditions of personnel training. "Formerly, for the purpose of accomplishing victory in armed combat," write the authors, "it was possible to build up efforts for handling equipment and weapons and for training cadres and the entire personnel gradually, during the war" (p. 177). Now the situation is different. It presupposes transferring the center of gravity of all personnel training efforts to peacetime. This is undoubtedly related also to ideological training. "During peacetime the moral strength of the troops must be raised to unprecedented heights by the entire system of party-political work" (p. 177). With the beginning of rapidly developing military operations there will be little time for systematic and thorough propaganda work. For this reason each soldier must be morally ready for battle at any moment. And, what is especially important, he must fully understand the savage aspect of imperialism and know about its plans and activities, and about its criminal antipopular crimes.

The growth in the proportion of a country's military efforts in peacetime bears the character of a specific law of nuclear war. The effect of this law applies to all the branches in the military organization. It is a pity that certain elements of the effect of this law have not been fully explained in this collection. In particular, on pages 46-47, where characteristics of economic, moral-political and military potentials are given, the specific character of their appearance in nuclear war, connected with the effect of the above-mentioned law, is not revealed.

In the book much attention is given to problems of high combat readiness of the Armed Forces for an immediate strike against an aggressor who has started a nuclear war. In a situation where the surprise factor and the

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initial period of the war, can play a decisive role, as indicated in the article by Army Gen A. A. YEPISHEV, troops must continually be in high battle readiness. "Not days and months, as in the past, but hours and minutes, or even seconds -- that is the period of time by which the degree of battle readiness of troops is measured. To be always on the alert is not easy, but it is extremely necessary. And our soldiers understand this very well -- from the private up to a high military commander (p. 12).

In this connection the book throws light on questions of the role of the individual in war and the organization of troop control.

The question of sharply increasing the individual responsibility of each soldier for the work assigned to him is raised in various aspects and in several articles. In an era of new weaponry the least lack of discipline or disorganization of even one man can lead to fatal results for tens and hundreds of thousands of his comrades in arms. No matter how complex and powerful equipment may be, the fate of a battle and a war is decided by "people who are masters of this equipment, strong in spirit and body, immeasurably dedicated to the ideas of communism, and ready for any combat task, in spite of mortal danger" (p. 15).

The revolution in military affairs corresponds to deep changes even in the development of our society, which is now rising to a qualitatively new stage in the building of communism. One of the most important features of these changes is the further widening of the front in the struggle for the utmost, comprehensive development of the human personality. The party requires from us a more decisive struggle in order that not only "the masses" but each individual be in the center of our attention. The Soviet government is giving the individual more and more blessings. The process of training, education and guidance of each individual for the time being still lags behind the requirements set by the party and our entire society. So it is even in the army. "Not the masses, not the personnel as a whole, but the individual with his first name and surname," it says in the book, "with all his attending merits and deficiencies, with the peculiarities in the constitution of his mind and his character -- that is the main thing in education, the deciding link in the chain of work for any educator, be he commander of a chast' or commander of a section, a party leader or a Komsomol activist" (p. 17).

The requirements stress the urgent necessity for wide adoption in the army of specific social research that involves the study of general social, specific and concrete factors influencing the molding and education of an individual up to his entry into the army and while in the army. It is about time to create an institute or a scientific center -- laboratories for military-social research at least on public principles, on the basis of the existing academies, schools, staffs and political organs.

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The article by Army Gen P. A. KUROCHKIN, "Modern Combat and One-Man authority" is very interesting. The dynamism, keenness and fast-moving quality introduced into military operations on any scale by rocket-nuclear and any other type of the newest equipment immeasurably increases the responsibility of a one-man commander and increases the difficulty of the tasks entrusted to him. The author is right when he indicates the necessity of allowing a one-man commander more independence and initiative and of implanting in him a sense of daring responsibility, and readiness to take a risk.

In addition, one should not completely discard the opinion that in certain spheres of military command there should be instances of joint forms of leadership. In reality, under modern conditions the amount of time at the commander's disposal has been shortened and the flow of information has grown. For this reason it becomes difficult for a one-man commander to show the necessary speed, efficiency, initiative and daring without an all-around analysis of information. It turns out that the commander's dependence on the staff group working on the collection and analysis of essential data has grown. This results in the necessity of deciding questions in searching for new, more flexible forms for a commander's support by the staff group.

Unfortunately, there are some unclear formulations in the book. For example, on page 49 there is some overlapping in the concepts of "types" (tipov), "forms" (vidov) and "categories" (kategoriy) of wars. It is known that war may be considered as a two-sided struggle and may be designated as follows: "War between a socialist and a capitalist government," "imperialist war on both sides," "civil war" and so on. In this instance we are dealing with the concept of "type" of war, which reflects its social-political characteristics. War may also be evaluated as action of one of the warring sides. In that case we would have to use the term "form" of the war. This, according to the character of the struggle waged by one side, the following forms are distinguished: "war in defense of the socialist fatherland," "national liberation war," "colonial war," and so on.

The word "category" applied to war defines the wars according to their scale, in which the social-political content should be specifically stipulated. Thus, a local war can have to most varied character, being imperialistic only on one side (but on the other, of course, it is liberationist!). The most varied governments, including socialist governments (for example the Korean People's Democratic Republic, 1950-1953), can participate in a local war. It seems to us that in using the words "type", "form", and "category" applied to war it is essential to give more precise definition.

One can scarcely agree with the statement which ignores the political factor, i. e., that "the new means of armed combat define the decisive objectives of a war" (p. 80). The degree of decisiveness of objectives in a war is defined mainly by political factors.

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The opinion, allegedly confirmed by the history of the development of military art, that "not a single warring country has ever profited by a prolonged war" (p. 131) is also incorrect. It all depends on the specific conditions. KUTUZOV in 1812, for example, depended mainly on a prolonged war.

On the whole, the publication of the collection of articles, Problemy revolyutsii v voyennom dele (Problems of the Revolution in Military Affairs) is useful for the mass reader: it will help him to become acquainted with the essence of the revolution in military affairs and with the range of problems resulting from it.

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